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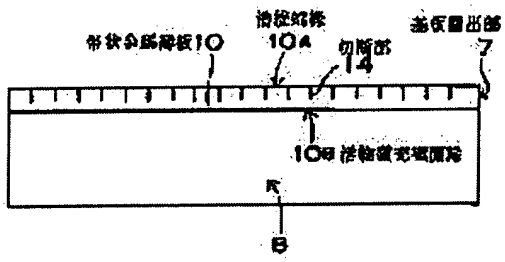
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(54) BATTERY AND ITS MANUFACTURE

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce warp of an electrode plate in which a belt-shaped metal sheet is welded to the exposed part of a substrate and extremely reduce internal short circuit in the state actually assembled as a battery.

SOLUTION: A battery has an electrode group formed by stacking a first electrode plate and a second electrode plate comprising a positive electrode plate and a negative electrode plate respectively through a separator, an outer can for housing the electrode group, and a current collecting plate electrically connected to the first electrode plate and electrically connecting the first electrode plate to one terminal. The first electrode plate is a non-sintered electrode in which an active material is filled in a metal three-dimensional porous body, and has a substrate exposed part 7 in which the substrate is exposed. A belt- shaped metal sheet 10 is welded to the substrate exposed part 7, and the belt-shaped metal sheet 10 has a plurality of cut parts 14 at specified intervals. The cut parts 14 cut off a welding edge 10A to be welded to the current collecting plate, and an active material filling side edge 10B on the opposite side of a welding edge 10A is continuously installed.



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CLAIMS

[Claim(s)]
[Claim 1] The electrode group which carried out the laminating of the 1st plate (1) which consists of a positive-electrode plate and a negative-electrode plate, and the 2nd plate (2) through the separator (3) (4), Electrical connection is carried out to the sheathing can (5) which has contained this electrode group (4), and the 1st plate (1), and it has the collecting electrode plate (6) which connects the 1st plate (1) to one terminal electrically. The 1st plate (1) It has the substrate outcrop (7) to which it is the non-sintering electrode which has filled up the substrate (9) of a metal three-dimension porous body with the active material, and the substrate (9) is exposed. In the cell which welds [this / substrate] the band-like metallic thin plate (10) (7), and comes to weld a band-like metallic thin plate (10) (6) The band-like metallic thin plate (10) by which joining is carried out to a substrate outcrop (7) has prepared two or more cutting sections (14) at predetermined spacing. This cutting section (14) The cell characterized by separating the welding edge (10A) welded to a collecting electrode plate (6), and coming to prepare the active material restoration side edge (10B) of the opposite side of the welding edge (10A) in the condition of continuing.
[Claim 2] The cell indicated by claim 1 whose cutting section (14) is the shape of a straight line, circular, an ellipse form, a hen's egg form, or a triangle.
[Claim 3] The cell indicated by claim 1 whose depth of the cutting section (14) is less than 100% in full [of a band-like metallic thin plate (10) / 30% or more of].
[Claim 4] The cell indicated by claim 1 whose spacing of the cutting section (14) adjoined and prepared is 50mm or less.
[Claim 5] The cell indicated by claim 1 whose total die length of the aperture width of the cutting section (14) in the welding edge (10A) is less than 10% of the overall length of a band-like metallic thin plate (10).
[Claim 6] The welding edge (10A) welded to a collecting electrode plate (6) at the substrate outcrop (7) of the substrate (9) which is the metal three-dimension porous body filled up with an active material is separated at the predetermined spacing. The joining process which welds the band-like metallic thin plate (10) which prepares two or more cutting sections (14) at the predetermined spacing, and becomes so that the active material restoration side edge (10B) of the opposite side of the welding edge (10A) may be made to connect, and manufactures a plate, The laminating process which carries out the laminating of the 2nd plate (2) to the 1st plate (1) which welded the band-like metallic thin plate (10) through a separator (3), and manufactures an electrode group (4), The process which welds [which was formed in the 1st plate (1) of an electrode group (4) / band-like] a collecting electrode plate (6) (10), The manufacture approach of the cell which consists of the process which inserts in a sheathing can (5) the electrode group (4) which comes to weld a collecting electrode plate (6), a process poured in a sheathing can (5), and a process which blockades opening of a sheathing can (5).
[Claim 7] The welding edge (10A) welded to a collecting electrode plate (6) at the substrate outcrop (7) of the substrate (9) which is the metal three-dimension porous body filled up with an active material is separated at the predetermined spacing. The joining process which welds the band-like metallic thin plate (10) which prepares two or more cutting sections (14) at the predetermined spacing, and becomes so that the active material restoration side edge (10B) of the opposite side of the welding edge (10A) may be made to connect, and manufactures a plate, The decision process which judges a band-like metallic thin plate (10) by predetermined width of face along with the welding edge (10A), The laminating process which carries out the laminating of the 2nd plate (2) to the 1st plate (1) which judged the band-like metallic thin plate (10) through a separator (3), and manufactures an electrode group (4), The process which welds [which was formed in the 1st plate (1) of an electrode group (4) / band-like] a collecting electrode plate (6) (10), The manufacture approach of the cell which consists of the process which inserts in a sheathing can (5) the electrode group (4) which comes to weld a collecting electrode plate (6), a process poured in a sheathing can (5), and a process which blockades opening of a sheathing can

(5).
[Claim 8] The manufacture approach of the cell indicated by claim 7 which judges a band-like metallic thin plate (10) in a decision process to the width of face which removes the cutting section (14).
[Claim 9] While preparing a substrate outcrop (7) in the substrate (9) of the metal three-dimension porous body filled up with an active material The joining process which welds [this / substrate] a band-like metallic thin plate (10) (7), and manufactures the 1st plate (1), In the condition of separating the welding edge (10A) of a band-like metallic thin plate (10), and making the active material restoration side edge (10B) of the opposite side of the welding edge (10A) continuing The cutting process which prepares two or more cutting sections (14) at predetermined spacing, and the laminating process which carries out the laminating of the 2nd plate (2) to the 1st plate (1) which judged the band-like metallic thin plate (10) through a separator (3), and manufactures an electrode group (4), The process which welds [which was formed in the 1st plate (1) of an electrode group (4) / band-like] a collecting electrode plate (6) (10), The manufacture approach of the cell which consists of the process which inserts in a sheathing can (5) the electrode group (4) which comes to weld a collecting electrode plate (6), a process poured in a sheathing can (5), and a process which blockades opening of a sheathing can (5).
[Claim 10] The manufacture approach of the cell indicated by claim 6 which makes the cutting section (14) of a band-like metallic thin plate (10) the shape of a straight line, circular, an ellipse form, a hen's egg form, or a triangle, claim 8, or claim 9.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention welds [of a metal three-dimension porous body] a band-like metallic thin plate, and relates to the cell which connected the collecting electrode plate to the band-like metallic thin plate, and raised the high-rate-discharge property, and its manufacture approach.
[0002]
[Description of the Prior Art] As an electrode plate used for an alkaline cell etc., there are a sintering type electrode and a non-sintering electrode. It has been used that a sintering type electrode is conventionally in use and mostly. This electrode infiltrates solutions, such as nickel salt and a force DOMIUMU salt, into a carbonyl nickel sintered compact, it carries out alkali treatment, active-material-izes, and is manufactured. However, since cost is reduced and it is made to a high energy consistency in recent years, the non-sintering electrode has become promising. A non-sintering electrode uses foaming nickel and metal three-dimension porous bodies, such as a nickel fiber porous body, as a substrate, fills up the opening of this substrate with a paste-like active material directly, and is manufactured.
[0003] Since a non-sintering electrode uses a metal three-dimension porous body for a substrate, like the punching metal used for the substrate of a sintering type electrode, it welds a lead plate to a substrate directly, and is not connectable with it. Since a metal three-dimension porous body has very few rates that almost all parts are openings and a metal part closes, even if it contacts a lead plate, it is because a touch area is restricted very small.
[0004] The technique which connects the substrate of a metal three-dimension porous body to a collecting electrode plate is indicated by the following official reports.
** JP,63-4562,A ** JP,2-220365,A [0005] ** The substrate outcrop which does not fill up the official report of ** with an active material along with the edge of the substrate of a metal three-dimension porous body is prepared, a band-like metallic thin plate is welded here, and the structure of connecting this part to a collecting electrode plate is indicated.
[0006] The electrode plate which welds [substrate] the band-like metallic thin plate is spirally wound through a separator, and serves as an electrode group. A collecting electrode plate 6 is welded and this spiral electrode group can be collected, as shown in the exploded view of drawing 1 . As shown in this drawing, the cell which welds [electrode / 4] a collecting electrode plate 6 raises a high-rate-discharge property, and can improve the discharge property in a high current.
[0007] However, when a band-like metallic thin plate is substrate welded [of a substrate], since heat telescopic motion with a metal three-dimension porous body and a band-like metallic thin plate is inharmonious, as shown in drawing 2 , the edge which welds the band-like metallic thin plate 10 contracts, the curvature of a plate arises, and there is a problem it becomes impossible to manufacture a uniform product. Ultrasonic welding of the band-like metallic thin plate 10 is carried out, or resistance electric welding of it is carried out, and it is welded to the substrate outcrop 7 of a substrate 9. The curvature of a plate becomes excessive although resistance electric welding is excellent in production efficiency. That is because contraction of the band-like metallic thin plate 10 becomes large by generation of heat at the time of resistance electric welding.
[0008] If the plate which curved as shown in drawing 2 carries out the laminating of the plate of another side through a separator, a location will shift. When the laminating of this is carried out and it is wound spirally, volume gap arises and it becomes impossible moreover, to arrange the end face of a swirl electrode group with a plane. The electrode group with the Maki gap lifting-comes to be easy of internal short-circuit, when pressing and welding a collecting electrode plate. It is because a projection part is crushed by the collecting electrode plate and breaks through a separator.

[0009] In order to cancel this fault, the cell which welds the band-like metallic thin plate which has the cutting section alternately to a substrate outcrop is developed (JP,64-71064,A). The cell indicated by this official report is alternately provided in the both sides of the band-like metallic thin plate 10 cutting section 14, as shown in drawing 3 . The plate which welded the band-like metallic thin plate 10 of this configuration to the substrate outcrop can lessen curvature.

[0010]

[Problem(s) to be Solved by the Invention] However, the cell which welded the band-like metallic thin plate of this structure to the substrate outcrop had the high probability which carries out internal short-circuit in the condition of having actually assembled, and had the fault to which the yield of a product worsens. Although this invention person etc. could lessen the curvature of the plate which welded the band-like metallic thin plate by the cutting section prepared alternately, he was not able to study why internal short-circuit would be carried out in the condition of having assembled. The swirl electrode group which carried out the laminating of the plate without curvature, and wound it is because an end face is arranged with a plane.

[0011] this invention person etc. studied having caused internal short-circuit by completely different cause, as a result of repeating further various trial-and-error, and completed this invention. therefore, the thing for which the important purpose of this invention welds [substrate] a band-like metallic thin plate, and can lessen the curvature of a plate -- in addition, it is in offering the cell which can decrease internal short-circuit ultimately, and its manufacture approach in the condition of having actually assembled as a cell.

[0012]

[Means for Solving the Problem] Electrical connection of the cell of this invention is carried out to the electrode group 4 which carried out the laminating of the 1st plate 1 which consists of a positive-electrode plate and a negative-electrode plate, and the 2nd plate 2 through the separator 3, the sheathing can 5 which has contained this electrode group 4, and the 1st plate 1, and it is equipped with the collecting electrode plate 6 which connects the 1st plate 1 to one terminal electrically. The 1st plate 1 has the substrate outcrop 7 to which it is the non-sintering electrode which has filled up the substrate 9 of a metal three-dimension porous body with the active material, and the substrate 9 is exposed. The band-like metallic thin plate 10 is substrate welded [this / 7], and the band-like metallic thin plate 10 is welded [6]. Furthermore, the band-like metallic thin plate 10 by which joining is carried out to the substrate outcrop 7 has formed two or more cutting sections 14 at predetermined spacing. This cutting section 14 separated welding edge 10A welded to a collecting electrode plate 6, and has prepared active material restoration side edge 10B of the opposite side of welding edge 10A in the condition of continuing.

[0013] Furthermore, the cell indicated to claim 2 of this invention makes the cutting section 14 the shape of a straight line, circular, the ellipse form, the hen's egg form, or the triangle.

[0014] Furthermore, the cell indicated to claim 3 of this invention makes the depth of the cutting section 14 less than 100% at full [of the band-like metallic thin plate 10 / 30% or more of].

[0015] Furthermore, the cell indicated to claim 4 of this invention is setting to 50mm or less spacing of the cutting section 14 prepared adjacently.

[0016] Furthermore, the cell indicated to claim 5 of this invention makes the total die length of the aperture width of the cutting section 14 in welding edge 10A less than 10% of the overall length of the band-like metallic thin plate 10.

[0017] The manufacture approach of the cell indicated to claim 6 of this invention Welding edge 10A welded to a collecting electrode plate 6 at the substrate outcrop 7 of the substrate 9 which is the metal three-dimension porous body filled up with an active material is separated at the predetermined spacing. The joining process which welds the band-like metallic thin plate 10 which forms two or more cutting sections 14 at the predetermined spacing, and becomes so that active material restoration side edge 10B of the opposite side of welding edge 10A may be made to connect, and manufactures a plate, The laminating process which carries out the laminating of the 2nd plate 2 to the 1st plate 1 which welded the band-like metallic thin plate 10 through a separator 3, and manufactures the electrode group 4, It consists of the process which welds [which was formed in the 1st plate 1 of the electrode group 4 / band-like / 10] a collecting electrode plate 6, the process which inserts in the sheathing can 5 the electrode group 4 which comes to weld a collecting electrode plate 6, a process poured in the sheathing can 5, and a process which blockades opening of the sheathing can 5.

[0018] The manufacture approach of the cell indicated to claim 7 of this invention Welding edge 10A welded to a collecting electrode plate 6 at the substrate outcrop 7 of the substrate 9 which is the metal three-dimension porous body filled up with an active material is separated at the predetermined spacing. The joining process which welds the band-like metallic thin plate 10 which forms two or more cutting sections 14 at the predetermined spacing, and becomes so that active material restoration side edge 10B of the opposite side of

welding edge 10A may be made to connect, and manufactures a plate, The decision process which judges a band-like metallic thin plate by predetermined width of face along with the welding edge, and the laminating process which carries out the laminating of the 2nd plate 2 to the 1st plate 1 which judged the band-like metallic thin plate 10 through a separator 3, and manufactures the electrode group 4, It consists of the process which welds [which was formed in the 1st plate 1 of the electrode group 4 / band-like / 10] a collecting electrode plate 6, the process which inserts in the sheathing can 5 the electrode group 4 which comes to weld a collecting electrode plate 6, a process poured in the sheathing can 5, and a process which blockades opening of the sheathing can 5.

[0019] Furthermore, the manufacture approach of the cell indicated by claim 8 of this invention is judging the band-like metallic thin plate 10 in a decision process to the width of face which removes the cutting section 14.

[0020] The manufacture approach of the cell indicated to claim 9 of this invention While forming the substrate outcrop 7 of the substrate 9 of the metal three-dimension porous body filled up with an active material In the condition of separating welding edge 10A of the band-like metallic thin plate 10 from the joining process which welds the band-like metallic thin plate 10, and manufactures the 1st plate 1 to this substrate outcrop 7, and making active material restoration side edge 10B of the opposite side of welding edge 10A following it The cutting process which forms two or more cutting sections 14 at predetermined spacing, and the laminating process which carries out the laminating of the 2nd plate 2 to the 1st plate 1 which judged the band-like metallic thin plate 10 through a separator 3, and manufactures the electrode group 4, It consists of the process which welds [which was formed in the 1st plate 1 of the electrode group 4 / band-like / 10] a collecting electrode plate 6, the process which inserts in the sheathing can 5 the electrode group 4 which comes to weld a collecting electrode plate 6, a process poured in the sheathing can 5, and a process which blockades opening of the sheathing can 5.

[0021] The manufacture approach of the cell indicated to claim 10 of this invention makes the cutting section 14 of the band-like metallic thin plate 10 the shape of a straight line, circular, the ellipse form, the hen's egg form, or the triangle further again.

[0022]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained based on a drawing. However, the gestalt of operation shown below does not illustrate the cell and its manufacture approach for materializing the technical thought of this invention, and this invention does not specify a cell and its manufacture approach as the following.

[0023] Furthermore, this specification has appended the number corresponding to the member shown in the gestalt of operation to the member shown in "the column of a claim", and "the column of The means for solving a technical problem" so that it may be easy to understand a claim. However, there is never nothing what specifies the member shown in a claim as the member of the gestalt of operation.

[0024] The cell shown in drawing 4 is equipped with the electrode group 4 inserted in the sheathing can 5 and this sheathing can 5 of the shape of a cylinder airtightly sealed with the obturation plate 11, and the collecting electrode plate 6 which connects the electrode group 4 to the terminal 12 of the sheathing can 5. Although the cell shown in drawing makes the sheathing can 5 cylindrical, this invention does not specify the sheathing can of a cell in the shape of a cylinder. Although a sheathing can is not illustrated, it can also be made square tubed thru/or ellipse tubed, for example.

[0025] The sheathing can 5 is iron and is carrying out nickel plating of the front face. As for the quality of the material of the sheathing can 5, the optimal metal is chosen in consideration of the class and property of a cell. A sheathing can may be made into stainless steel, aluminum, and the product made from an aluminium alloy. The metal sheathing can 5 has sealed opening of upper limit airtightly by the lid. Lids are approaches, such as carrying out laser welding of the boundary of a lid to the structure of closing the sheathing can 5, or a sheathing can, and are fixed airtightly. The obturation plate 11 is fixing one terminal 12 of a cell. This terminal 12 is insulated and fixed to the sheathing can 5.

[0026] The cell of this invention is the cell having a non-sintering electrode, for example, a nickel hydoride battery. However, this invention does not specify a cell as a nickel hydoride battery. It can also consider as a nickel-cadmium battery, a lithium ion battery, etc. at a cell. Hereafter, the gestalt of operation of a nickel hydoride battery is explained in full detail as a gestalt of desirable operation.

[0027] The electrode group 4 has wound the 1st plate 1 and the 2nd plate 2 through a separator 3. The cell shown in drawing uses as a positive-electrode plate the 1st plate 1 connected to a collecting electrode plate 6, and is using the 2nd plate 2 as the negative-electrode plate. However, this invention can also use the 2nd plate as a positive-electrode plate by using the 1st plate as a negative-electrode plate. The 1st plate 1 and the 2nd plate 2 by which the laminating was carried out through the separator 3 are wound, and are manufactured by the spiral electrode group 4. The spiral electrode group 4 is inserted in the cylinder-like sheathing can 5. A spiral

electrode group can be pressed from both sides, can be made to be able to deform into an ellipse form, and can be inserted in the sheathing can of an ellipse form. Furthermore, the electrode group inserted in an rectangular pipe-like sheathing can carries out the laminating of the 1st plate of two or more sheets and the 2nd plate which were cut out by tabular through a separator, and is manufactured.

[0028] As for a separator 3, the nonwoven fabric made from polyolefine is used. However, fine porosity film made of synthetic resin, such as polyethylene, can also be used for a separator 3. All the web materials that can insulate the 1st plate 1 and the 2nd plate 2 by which a laminating is carried out to both sides, and can permeate the electrolytic solution can be used for a separator 3.

[0029] The 1st plate 1 is a non-sintering electrode which has filled up the substrate 9 of a metal three-dimension porous body with the active material. The substrates 9 of a metal three-dimension porous body are a foaming nickel porous body, a nickel fiber porous body, etc. The 1st plate 1 has filled up the substrates 9, such as this, with the active material.

[0030] The substrate of the 1st plate 1 forms the substrate outcrop 7 in the upper part of a substrate 9, as shown in the development view of drawing 5 , and other parts are made into the active material restoration section 8 filled up with the active material. The substrate outcrop 7 removes the active material filled up with or filled up with the active material, and is exposing the substrate 9. Preferably, a substrate 9 is pressed by the substrate outcrop 7, and is compressed into high density. The compressed substrate outcrop 7 has the features which can certainly weld a band-like metallic thin plate.

[0031] In order to connect electrically certainly with a collecting electrode plate 6, the substrate outcrop 7 fixes the band-like metallic thin plate 10, as shown in the sectional view of drawing 6 . Resistance electric welding of the band-like metallic thin plate 10 is carried out, or ultrasonic welding of it is carried out and it is pasted up in the condition of connecting with the substrate outcrop 7 electrically.

[0032] It is nickel sheet metal, phosphorus nickel sheet metal, and sheet metal that carried out nickel plating to iron, and the thickness is 0.05mm or more, and that of the band-like metallic thin plate 10 is thinner than 80% of thickness of the 1st plate 1. When a band-like metallic thin plate is made thinner than 0.05mm, the reinforcement when welding a substrate outcrop to a collecting electrode plate becomes less enough. If the thickness of a band-like metallic thin plate becomes thicker [the 1st plate] than 80% on the contrary, where the laminating of the 1st plate and the 2nd plate is carried out through a separator, a substrate outcrop will become thick and space efficiency will fall. Thickness of the band-like metallic thin plate 10 is preferably set to 0.08-0.2mm.

[0033] The band-like metallic thin plate 10 has formed the cutting section 14 at the predetermined spacing. The band-like metallic thin plate 10 of drawing 7 has formed the straight-line-like cutting section 14. The cutting section 14 separates welding edge 10A (it sets to drawing 7 and is an upper limb) welded to a collecting electrode plate, and is prepared in the band-like metallic thin plate 10 in the condition of making active material restoration side edge 10B (it setting to drawing 7 and being the margo inferior) of the opposite side of welding edge 10A continuing. As shown in drawing 8 , joining of the band-like metallic thin plate 10 of drawing 7 is carried out to the substrate outcrop 7 of a substrate 9.

[0034] Furthermore, the cell of this invention can also form the cutting section 14 of circular, an ellipse form, and a triangle in the band-like metallic thin plate 10, as shown in drawing 9 - drawing 11 . Moreover, as shown in drawing 12 , the cutting section 14 of various configurations can be made intermingled, and it can also prepare. Furthermore, although not illustrated, the cutting sections, such as a hen's egg form, can also be prepared.

[0035] The depth of the cutting section 14 is specified to less than 100% at full [of the band-like metallic thin plate 10 / 30% or more of]. When the cutting section was shallower than 30% and the band-like metallic thin plate 10 is substrate welded [of a substrate 9 / 7], it is because it becomes impossible to prevent the curvature of a plate effectively. Moreover, if the cutting section 14 is extended to active material restoration side edge 10B, where a cell is assembled, internal short-circuit will increase.

[0036] Furthermore, spacing of the cutting section 14 is specified as 50mm or less. When spacing of the cutting section 14 was too large and the band-like metallic thin plate 10 is substrate welded [7], it is because it becomes impossible to prevent the curvature of a plate effectively. Furthermore, although the band-like metallic thin plate 10 shown in drawing 7 , drawing 9 - drawing 12 has formed the cutting section 14 at equal intervals, a band-like metallic thin plate can also prepare the cutting section at the above-mentioned irregular spacing within the limits.

[0037] Furthermore, as shown in drawing 9 - drawing 12 , the band-like metallic thin plate 10 as for which opening is made to welding edge 10A by the cutting section 14 makes the total die length of the aperture width of the cutting section 14 in welding edge 10A less than 10% of the overall length of the band-like metallic thin plate 10. It is because the welding mark of a collecting electrode plate will decrease and the electric resistance between the band-like metallic thin plate 10 and a collecting electrode plate will become large, if aperture width

becomes larger than this.
[0038] Preferably, the band-like metallic thin plate 10 forms the cutting section 14, and joining is carried out to the substrate outcrop 7 of a substrate 9. However, after substrate welding [of a substrate] a band-like metallic thin plate, it can also prepare the cutting section. The method of preparing the cutting section in the band-like metallic thin plate substrate welded cuts both a band-like metallic thin plate and a substrate outcrop, and prepares the cutting section.
[0039] Furthermore, the cell of this invention can also judge and remove a part with the cutting section 14, after substrate welding [7] the band-like metallic thin plate 10 with the cutting section 14, as shown in drawing 13 . As shown in drawing, the band-like metallic thin plate 10 judged after joining welds the part which formed the cutting section 14 so that it may project from the substrate outcrop 7, it judges after that in the location shown with the chain line, and removes the part which formed the cutting section 14. Moreover, as shown in drawing 14 , the band-like metallic thin plate 10 which has the cutting section 14 in the substrate outcrop 7 which made width of face large can be welded, and it can also judge from the location shown with the chain line after that. There is no band-like metallic thin plate 10 of the 14 cutting section of such structures in the condition of welding a collecting electrode plate. For this reason, there are the features which can be welded in the condition ideal for a collecting electrode plate. However, the cell of this invention can leave some cutting sections, can judge a band-like metallic thin plate, and can also weld a collecting electrode plate.
[0040] The substrate 9 which welded the band-like metallic thin plate 10 adheres masking tape 13 to both sides, as shown in drawing 6 . Masking tape 13 has extended the lower limit edge to a lower part rather than active material restoration side edge 10B. The plate of this structure is for preventing active material restoration side edge 10B bending, and breaking through a separator 3, when pressing and welding a collecting electrode plate 6 to the substrate outcrop 7 and the band-like metallic thin plate 10. The cell on which masking tape 13 is pasted up prevents internal short-circuit, and can band-like weld [the substrate outcrop 7 and / 10] a collecting electrode plate 6. However, a substrate outcrop is also connectable with a collecting electrode plate in the condition of not using masking tape.
[0041] A collecting electrode plate 6 cuts a metal plate to disc-like [among the sheathing cans 5 / smaller than a form], and makes lead plate 6A project, as it is the metal plate which carried out nickel plating to iron, or metal plates, such as a nickel plate, and is shown in drawing 15 . A collecting electrode plate 6 is arranged so that it may counter at the both ends of the electrode group 4. Although the collecting electrode plate 6 shown in drawing 15 is not illustrated, for example since the cell of this invention is not specified as a cylindrical shape cell, although it is circular, in order that the sheathing can 5 of a cell may use it for the cell which is a cylindrical shape, it can use a rectangle-like collecting electrode plate for a square shape cell.
[0042] The collecting electrode plate 6 has prepared slit 6C in the both sides of feed-hole 6B, in order to lessen the reactive current when carrying out resistance electric welding. Furthermore, opening of two or more through tube 6D is carried out. As shown in the expanded sectional view of drawing 16 , projection 6E which projects caudad is provided in the periphery of through tube 6D. Projection 6E is welded and connected to the substrate outcrop 7 of the 1st plate 1 in two or more parts. Lead plate 6A of a collecting electrode plate 6 is connected to the terminal 12 fixed to opening of the sheathing can 5 by insulating.
[0043] When the substrate outcrop 7 and the band-like metallic thin plate 10 are welded [6], it is important to contact the substrate outcrop 7 and the band-like metallic thin plate 10 to a collecting electrode plate 6 at homogeneity. A collecting electrode plate 6 is in the condition locally pressed with a welding electrode rod, and whether it does not deform at all or deformation is too large, it becomes impossible to contact homogeneity in a weld. If deformation is too large, although the weld of near pressed with a welding electrode rod is pressed strongly, its contact of the weld in the part which is separated from a welding electrode rod will be weak, or will leave it. If a collecting electrode plate 6 does not deform at all, only the weld in which the collecting electrode plate 6 and the substrate outcrop 7 project contacts strongly, and other welds stop moreover, contacting. Welds are contacted [no] to homogeneity and it becomes impossible for this reason, to weld in the ideal condition.
[0044]
[Example] At the following processes, the cylindrical nickel hydoride battery of SC size was made as an experiment, the configuration of a band-like metallic thin plate was changed, and the curvature of a plate and internal short-circuit were measured.
[0045] At the following processes, the electrode group inserted in the sheathing can of a nickel hydoride battery was manufactured.
a. Manufacture of the positive-electrode plate which is the 1st plate (1) A metal porous body is produced at the following process. It is immersed in the plating liquid of a cell and the organic porous body of the shape of sponge which is polyurethane foam of an open cell is plated, after carrying out electric conduction processing.

Predetermined time calcining of the plated organic porous body is carried out at the temperature of 750 degrees C, the resinous principle of an organic porous body is removed, further, it sinters by reducing atmosphere and a metal porous body is manufactured. The metal porous body manufactured at this process is foaming nickel which makes eyes about 600 g/m2, makes porosity 95%, and sets thickness to about 2.0mm.
[0046] (2) Knead the following and consider as the active material slurry of a positive electrode.
Nickel hydroxide powder 90 weight sections (they are contained using a 2.5wt% zinc and 1wt% cobalt as a coprecipitation component)
Cobalt powder Ten weight sections Zinc-oxide powder Three weight sections 0.2 % of the weight water solution of hydroxypropylcellulose .. 50 weight sections [0047] (3) The opening of a metal porous body was filled up with the active material slurry of the produced positive electrode. The fill was adjusted so that the active material consistency after roll rolling might serve as about 2.91g/cc-void. Then, it dried, and opening-RU rolling was performed so that thickness might be set to about 0.70mm. Furthermore, it cut in the shape of a strip of paper, and the ultrasonic exfoliation which adds vertical supersonic vibration removed the active material to the substrate outcrop 7 which welds the band-like metallic thin plate 10. And as shown in drawing 5 , it considers as the 1st plate 1 with the substrate outcrop 7 which a substrate 9 exposes.
[0048] The 1st plate can also manufacture a substrate outcrop at the following processes. As shown in drawing 17 , before being filled up with an active material, roll rolling of the part which is a part of metal porous body, and serves as the substrate outcrop 7 is carried out in parallel by predetermined width of face. Width of face of roll rolling is set to about 6 twice as manymm as the width of face of the substrate outcrop 7, and sets thickness after rolling to 0.5mm. Thus, the above-mentioned active material slurry is filled up with and rolled out to the substrate 9 of a metal porous body rolled out. Then, it cuts in the location shown by the arrow head of drawing 17 , and the strip-of-paper-like 1st plate 1 is produced. Then, along with the part used as the substrate outcrop 7 rolled out thinly, a compressed air is injected, or a brush etc. is used, an active material is removed, and a substrate 9 is exposed.
[0049] (4) Paste up the band-like metallic thin plate 10 on the substrate outcrop 7 which the substrate 9 exposed by resistance electric welding. The substrate outcrop 7 and the band-like metallic thin plate 10 set welding pressure to 10kgf(s), and carried out resistance electric seam welding. The nickel ribbon of 0.1mm thickness was used for the band-like metallic thin plate 10, and the width of face was set to 3mm.
[0050] b. Manufacture of the negative-electrode plate which is the 2nd plate (1) Weighing capacity of the manganese is carried out to 1.0:3.4:0.8:0.2:0.6 by the element ratio, and it mixes with production and the grinding misch metal (mixture of rare earth elements, such as La, Ce, Nd, and Pr) of a hydrogen storing metal alloy, nickel, cobalt, and aluminum, after putting this into a crucible and fusing with a RF fusion furnace, it cools, and the hydrogen storing metal alloy electrode of the following empirical formula is produced.
After carrying out coarse grinding of Mm1.0nickel3.4Co0.8aluminum0.2Mn0.6 and the obtained ingot of a hydrogen storing metal alloy beforehand, it is ground so that mean particle diameter may be set to 60 micrometers in inert gas.
[0051] (2) Add polyethylene oxide powder as a binder to the powder of the hydrogen storing metal alloy in which the hydrogen storing metal alloy slurry carried out production grinding, add and knead ion exchange water further to it, and consider as a slurry. The addition of the polyethylene oxide powder which is a binder is made into 1.0 % of the weight to a hydrogen storing metal alloy.
[0052] (3) Both sides of the substrate which is a punching metal were plastered with the slurry. The amount of application was adjusted so that the active material consistency after rolling might be set to cc in 5g /. Then, after performing desiccation and rolling, it cut in the predetermined dimension and considered as the negative-electrode plate which is the 2nd plate 2. The slurry left and applied the margo inferior so that a substrate outcrop might be made to the margo inferior of a punching metal. Moreover, after applying a slurry all over a punching metal, it can dry, the active material of the margo inferior can be removed, and a substrate outcrop can also be prepared.
[0053] The 1st plate 1 manufactured at the above process and the 2nd plate 2 were wound through SEBARETA 3 which consists of a nonwoven fabric made from polyolefine, it considered as the spiral electrode group 4, and the swirl electrode was produced. A collecting electrode plate 6 is band-like welded [which projects at the upper limit edge of this swirl electrode / 10] in resistance electric welding. The iron plate which carried out nickel plating with a thickness of 0.40mm by disc-like was used for the collecting electrode plate 6.
[0054] The 1st plate 1 and the 2nd plate 2 which were produced by the above approach were used, and the cylindrical nickel hydoride battery was made as an experiment. The cell made as an experiment changed as follows the configuration of the band-like metallic thin plate 10 used for the 1st plate 1, manufactured the cell,

and inspected the number which carried out internal short-circuit with the amount of curvatures of a plate. The amount of curvatures of a plate was in the condition which welded [of the plate / substrate / 7] the band-like metallic thin plate 10, and as it was shown in drawing 2 , it was measured to it.
[0055] The cutting section of a [examples 1-8] band-like metallic thin plate was determined as shown in Table 1, and the 1st plate of 100 sheets was made as an experiment respectively. The 1st plate of 100 sheets was used and 100 electrode groups were made as an experiment. 100 electrode groups sorted out the thing without the Maki gap, inserted it in the sheathing can, and assembled the cell. Since only the electrode group without the Maki gap was inserted in the sheathing can and it assembled as a cell, in each example, it does not necessarily become 100 cells. For example, in 100 electrode groups, when the Maki gap was in 30 electrode groups, the number which assembled the 70 remaining electrode groups and short-circuited as a cell was inspected. The cell of the following examples and the example of a comparison sorted out only the electrode group without the Maki gap similarly, inserted it in the sheathing can, and was assembled as a cell.
[0056] That from which the depth and spacing of the cutting section differ the cutting section of a band-like metallic thin plate as the shape of a straight line as shown in drawing 7 was used for the cell of examples 1-8. The depth and spacing of the cutting section of a band-like metallic thin plate which are used for the cell of examples 1-8 were determined as shown in Table 1.
[0057]
[Table 1]

	切れ目		
	向き	切り込み長さ(mm)	切り込み間隔(mm)
実施例1	外側	1．0	30
実施例2	外側	2．0	30
実施例3	外側	2．5	30
実施例4	外側	2．0	10
実施例5	外側	2．0	20
実施例6	外側	2．0	30
実施例7	外側	2．0	40
実施例8	外側	2．0	50
比較例1	無し		
比較例2	内側	2．0	30
比較例3	千鳥状	2．0	30

[0058] Furthermore, in order that the cell of the example of this invention might compare how the outstanding property is shown, the cutting section of a band-like metallic thin plate was used as the cell of the examples 1, 2, and 3 of a comparison like the above-mentioned example except changing as follows.
The 1st plate was created using the band-like metallic thin plate without the [example 1 of comparison] cutting section, this 1st plate was used, and the cell was made as an experiment like the example 1.
The 1st plate was created using the band-like metallic thin plate which prepared the cutting section which sets the [example 2 of comparison] depth to 2mm at intervals of 30mm, and the cell was made as an experiment using this 1st plate. Without separating the welding edge, the cutting section prepared it, as the active material restoration side edge of the opposite side was separated.
The band-like metallic thin plate which prepared alternately the cutting section which sets the [example 3 of comparison] depth to 2mm at intervals of 30mm was produced, and the cell was manufactured using this 1st plate.
[0059] The short generating number of the amount of curvatures of the 1st plate made as an experiment as mentioned above and the cell which used this 1st plate became as it is shown in Table 2.
[0060]

[Table 2]

	反り量(mm)	巻ズレ	内部ショート
実施例1	0．02	0	0
実施例2	0．01	0	0
実施例3	0．01	0	0
実施例4	0．00	0	0
実施例5	0．01	0	1
実施例6	0．00	0	0
実施例7	0．01	0	1
実施例8	0．02	0	0
比較例1	1．57	100	電池にならない
比較例2	0．07	1	33
比較例3	0．01	0	28

[0061] Like [it is ****** from this table and], the cell of this invention had few amounts of curvatures of a plate, and the Maki gap and its internal short-circuit also decreased. Although the amount of curvatures of a plate decreased, the cell of the example 3 of a comparison which used the band-like metallic thin plate which prepared the cutting section alternately is in the condition assembled as a cell, and no less than 28% of cell carried out internal short-circuit. Moreover, although the amount of curvatures of a plate decreased, no less than 33 cells carried out the internal short-circuit of the cell of the example 2 of a comparison which used the band-like metallic thin plate which prepared the cutting section so that an active material restoration side edge might be separated.

[0062] If shallow, the amount of curvatures of a plate will become large, the Maki gap also becomes large, and it becomes easy to carry out the internal short-circuit of the cutting section prepared in a band-like metallic thin plate. In order to examine the Maki gap and the internal short-circuit to the depth of the cutting section, the band-like metallic thin plate which prepared the cutting section which makes the depth 30% or less was used, and the cell was made as an experiment like the above-mentioned example. Consequently, when the width of face of the cutting section became 30% or less, the Maki gap became large and the rate which carries out internal short-circuit increased. As for the cell of this to this invention, it is desirable to make full [of a band-like metallic thin plate / 30% or more of] the depth of the cutting section prepared in a band-like metallic thin plate. Furthermore, if the depth of the cutting section is made 100%, since the cutting section will be extended to an active material restoration side edge, the depth of the cutting section is made shallower than 100%.

[0063] Moreover, even if spacing of the cutting section prepared in a band-like metallic thin plate is large, the amount of curvatures becomes large, the Maki gap of a plate becomes large, and it becomes easy to carry out internal short-circuit. In order to examine the amount of curvatures and the Maki gap to spacing, and internal short-circuit of the cutting section adjoined and prepared, the band-like metallic thin plate which prepared the cutting section which sets spacing to 50mm or more was used, and the cell was made as an experiment like the above-mentioned example. Consequently, when spacing of the cutting section exceeded 50mm, the amount of curvatures and the Maki gap became large, and the rate which carries out internal short-circuit increased. As for the cell of this to this invention, it is desirable to set to 50mm or less spacing of the cutting section prepared in a band-like metallic thin plate.

[0064] Furthermore, the configuration of the cutting section was changed and the cell of the following examples was made as an experiment. The cell of the following examples was made as an experiment like the cell of the above-mentioned example except changing the configuration of the cutting section.

[0065] That from which the depth of the cutting section differs the cutting section of a band-like metallic thin plate as an equilateral triangle as shown in drawing 11 was used for the cell of the [examples 9 and 10] examples 9 and 10. The depth of the cutting section of the band-like metallic thin plate used for the cell of examples 9 and

10 was determined as shown in Table 3. The triangle which is the cutting section set die length of one side to 1mm. Moreover, spacing of the cutting section was set to 30mm.
[0066] The depth of the cutting section of a band-like metallic thin plate was determined as shown in Table 3, and the 1st plate of 100 sheets was made as an experiment respectively. The 1st plate of 100 sheets was used and 100 electrode groups were made as an experiment. 100 electrode groups sorted out the thing without the Maki gap, inserted it in the sheathing can, and assembled the cell.
[0067]
[Table 3]

	打ち抜き位置長さ(深さ)(mm)	全幅に対する深さ割合(%)	開放部延べ長さ(mm)	全長に対する割合(%)
実施例9	1．0	33．3	10．4	3．7
実施例10	1．5	50．0	15．6	5．6

 [0068] The amount of curvatures of the plate of the cell made as an experiment as mentioned above, and the Maki gap and a short incidence rate became as it is shown in Table 4.
[0069]
[Table 4]

	極板反り(mm)	不良発生数／100セル中		高率放電30A放電時作動電圧(V)
		巻ズレ(セル)	ショート(セル)	
実施例9	0．02	1	0	1．039
実施例10	0．01	0	0	1．037

[0070] Like [it is ****** from this table and], the cell of this invention had few amounts of curvatures of a plate, and the Maki gap and its internal short-circuit also decreased.
[0071] Furthermore, the configuration of the cutting section was circularly changed from the triangle, and the cell of the following examples was made as an experiment. The cell of the following examples was made as an experiment like the cell of the above-mentioned example except changing the configuration of the cutting section.
[0072] That from which the depth of the cutting section differs the cutting section of a band-like metallic thin plate as circular as shown in drawing 9 was used for the cell of the [examples 11 and 12] examples 11 and 12. The depth of the cutting section of the band-like metallic thin plate used for the cell of examples 11 and 12 was determined as shown in Table 5. The radius of a circle was set to 1mm. Moreover, spacing of the cutting section was set to 30mm.
[0073] The depth of the cutting section of a band-like metallic thin plate was determined as shown in Table 5, and the 1st plate of 100 sheets was made as an experiment respectively. The 1st plate of 100 sheets was used and 100 electrode groups were made as an experiment. 100 electrode groups sorted out the thing without the Maki gap, inserted it in the sheathing can, and assembled the cell.
[0074]
[Table 5]

	打ち抜き位置長さ(深さ)(mm)	全幅に対する深さ割合(%)	開放部延べ長さ(mm)	全長に対する割合(%)
実施例11	1．0	33．3	18．0	6．4
実施例12	1．8	60．0	10．8	3．9

[0075] The amount of curvatures of the plate of the cell made as an experiment as mentioned above, and the Maki gap and a short incidence rate became as it is shown in Table 6.
[0076]
[Table 6]

	極板反り (mm)	不良発生数／１００セル中		高率放電３０Ａ放電時作動電圧(V)
		巻ズレ(セル)	ショート(セル)	
実施例１１	0．０１	0	0	1．０３７
実施例１２	0．０２	1	0	1．０３８

[0077] Like [it is ****** from this table and], the cell of this invention had few amounts of curvatures of a plate, and the Maki gap and its internal short-circuit also decreased.
[0078] Furthermore, the configuration of the cutting section was changed into the triangle from which the depth differs, having used aperture width as the same, and the cell of the following examples was made as an experiment. The cell of the following examples was made as an experiment like the cell of the above-mentioned example except changing the configuration of the cutting section.
[0079] Although the cell of the [examples 13 and 14] examples 13 and 14 made the triangle the cutting section of a band-like metallic thin plate as shown in drawing 11 , this triangle set the aperture width of the welding edge constant by 2mm, and changed the depth of triangular top-most vertices. The depth of the cutting section of the band-like metallic thin plate used for the cell of examples 13 and 14 was determined as shown in Table 7. Spacing of the cutting section which is a triangle was set to 30mm.
[0080] The depth of the cutting section of a band-like metallic thin plate was determined as shown in Table 7, and the 1st plate of 100 sheets was made as an experiment respectively. The 1st plate of 100 sheets was used and 100 electrode groups were made as an experiment. 100 electrode groups sorted out the thing without the Maki gap, inserted it in the sheathing can, and assembled the cell.
[0081]
[Table 7]

	打ち抜き位置長さ(深さ) (mm)	全幅に対する深さ割合(%)	開放部延べ長さ (mm)	全長に対する割合(%)
実施例１３	1．５	５０．０	１８．０	6．４
実施例１４	2．５	８３．３	１８．０	6．４

[0082] The amount of curvatures of the plate of the cell made as an experiment as mentioned above, and the Maki gap and a short incidence rate became as it is shown in Table 8.
[0083]
[Table 8]

	極板反り (mm)	不良発生数／１００セル中		高率放電３０Ａ放電時作動電圧(V)
		巻ズレ(セル)	ショート(セル)	
実施例１１	0．０１	0	0	1．０３８
実施例１２	0．０１	0	0	1．０３８

[0084] Like [it is ****** from this table and], the cell of this invention had few amounts of curvatures of a plate, and the Maki gap and its internal short-circuit also decreased.
[0085] Furthermore, the configuration of the cutting section was made circular, spacing of the cutting section was changed, and the cell of the following examples was made as an experiment. The cell of the following examples was made as an experiment like the cell of the above-mentioned example except changing the cutting section.
[0086] That from which the depth of the cutting section is set constant by 1mm as circular as shown in drawing 9 , and spacing of the cutting section differs the cutting section of a band-like metallic thin plate was used for the cell of the [examples 15-20] examples 15-20. Spacing of the cutting section of the band-like metallic thin plate used for the cell of examples 15-20 was determined as shown in Table 9. However, the radius of a circle was set to 1mm.
[0087] Spacing of the cutting section of a band-like metallic thin plate was determined as shown in Table 9, and

the 1st plate of 100 sheets was made as an experiment respectively. The 1st plate of 100 sheets was used and 100 electrode groups were made as an experiment. 100 electrode groups sorted out the thing without the Maki gap, inserted it in the sheathing can, and assembled the cell.

[0088]

[Table 9]

	打ち抜き間隔 (mm)	開放部延べ長さ (mm)	全長に対する割合(%)
実施例15	10	56.0	20.0
実施例16	15	36.0	12.9
実施例17	20	28.0	10.0
実施例18	30	18.0	6.4
実施例19	40	14.0	5.4
実施例20	50	10.0	3.6

[0089] The amount of curvatures of the plate of the cell made as an experiment as mentioned above, and the Maki gap and a short incidence rate became as it is shown in Table 10.

[0090]

[Table 10]

	極板反り (mm)	不良発生数／100セル中		高率放電 30A放電時 作動電圧(V)
		巻ズレ(セル)	ショート(セル)	
実施例15	0.02	1	0	1.016
実施例16	0.01	0	0	1.021
実施例17	0.03	0	1	1.027
実施例18	0.01	0	0	1.037
実施例19	0.01	0	1	1.035
実施例20	0.02	2	0	1.038

[0091] Like [it is ****** from this table and], the cell of this invention had few amounts of curvatures of a plate, and the Maki gap and its internal short-circuit also decreased. This table also shows that the discharge voltage at the time of making it discharge by 30A falls, if the total die length of the aperture width of the cutting section exceeds 10% to the overall length of a band-like metallic thin plate. For this reason, in order to receive the high rate discharge in a high current, as for the total die length of opening of the cutting section, it is desirable to carry out to less than 10% of the overall length of a band-like metallic thin plate.

[0092] Furthermore, while making the configuration of the cutting section circular, the radius of the circle which is the cutting section was changed and the cell of the following examples was made as an experiment. The cell of the following examples was made as an experiment like the cell of the above-mentioned example except changing the radius of the circle which is the cutting section.

[0093] That from which the depth of the cutting section is set constant by 1mm as circular as shown in drawing 9 , and the radius of a circle differs the cutting section of a band-like metallic thin plate was used for the cell of the [examples 21-28] examples 21-28. The radius of the circle which is the cutting section of the band-like metallic thin plate used for the cell of examples 21-28 was determined as shown in Table 11. However, the depth of the cutting section presupposed that it is fixed by 1mm. Moreover, spacing of the cutting section was set to 30mm.

[0094] Spacing of the cutting section of a band-like metallic thin plate was determined as shown in Table 11, and

the 1st plate of 100 sheets was made as an experiment respectively. The 1st plate of 100 sheets was used and 100 electrode groups were made as an experiment. 100 electrode groups sorted out the thing without the Maki gap, inserted it in the sheathing can, and assembled the cell.

[0095]

[Table 11]

	半径 (mm)	切り欠き、または打ち抜き	
		開放部延べ長さ (mm)	全長に対する割合(%)
実施例21	0.75	12.7	4.5
実施例22	1.00	18.0	6.4
実施例23	1.25	22.0	7.9
実施例24	1.50	25.5	9.1
実施例25	1.75	28.5	10.2
実施例26	2.00	31.2	11.1
実施例27	2.25	33.7	12.0
実施例28	2.50	36.0	12.9

[0096] The amount of curvatures of the plate of the cell made as an experiment as mentioned above, and the Maki gap and a short incidence rate became as it is shown in Table 12.

[0097]

[Table 12]

	極板反り (mm)	不良発生数／100セル中		高率放電 30A放電時 作動電圧(V)
		巻ズレ(セル)	ショート(セル)	
実施例21	0.01	0	1	1.038
実施例22	0.01	0	0	1.037
実施例23	0.01	1	0	1.038
実施例24	0.01	0	1	1.037
実施例25	0.01	1	0	1.028
実施例26	0.01	0	0	1.025
実施例27	0.01	0	0	1.022
実施例28	0.02	0	1	1.021

[0098] Like [it is ****** from this table and], the cell of this invention had few amounts of curvatures of a plate, and the Maki gap and its internal short-circuit also decreased. This table also shows that the discharge voltage at the time of making it discharge by 30A falls, if the total die length of the aperture width of the cutting section exceeds 10% to the overall length of a band-like metallic thin plate. For this reason, in order to receive the high rate discharge in a high current, as for the total die length of opening of the cutting section, it is desirable to carry out to less than 10% of the overall length of a band-like metallic thin plate.

[0099] The above example welded [of the plate / substrate] the band-like metallic thin plate which prepared the

cutting section, and manufactured the plate with little curvature. However, the cell of this invention can also manufacture a plate with little curvature, so that the welding edge of a band-like metallic thin plate is judged and ** is not inferior to the above-mentioned example, after substrate welding [of a plate] the band-like metallic thin plate which prepared the cutting section. Since aperture width of the cutting section is made as for this plate to 0 by cutting off the part which prepared the cutting section of a band-like metallic thin plate, it is improved by the high-rate-discharge property in a high current. Incidentally as for the cell made as an experiment by this approach, the electrical potential difference when discharging by 30A became as high as 1.039V, and the amount of curvatures of a plate was set to only 0.01mm.

[0100] Furthermore, a plate with little curvature can also be manufactured, so that the welding edge of a band-like metallic thin plate may be separated and ** is not inferior to the plate which welded and manufactured the band-like metallic thin plate which has the cutting section by preparing the cutting section to the substrate outcrop, after substrate welding [of a plate] the band-like metallic thin plate in which the cell of this invention does not have the cutting section again.

[0101]

[Effect of the Invention] The cell of this invention has the features that internal short-circuit can be decreased ultimately, in the condition of having actually assembled as a cell while being able to lessen the curvature of the plate which welded [substrate] the band-like metallic thin plate. While it welds the band-like metallic thin plate with which the cell of this invention prepared two or more cutting sections at predetermined spacing in the substrate outcrop of the substrate of the 1st plate, it is because the band-like metallic thin plate is welded, this band-like metallic thin plate separates further the welding edge welded to a collecting electrode plate in the cutting section and the active material restoration side edge of the opposite side of the welding edge is made into the condition of continuing. The band-like metallic thin plate of this structure can lessen the curvature of the plate which welded [substrate] the band-like metallic thin plate by separating the welding edge by which joining is carried out to a collecting electrode plate in the cutting section. For this reason, the end face of the electrode group by which the laminating was carried out is arranged with a plane, and there are the features that a uniform product can be manufactured. Furthermore, since the band-like metallic thin plate of this structure makes the condition of continuing the active material restoration side edge of the opposite side of the welding edge, the features which decrease ultimately generating of internal short-circuit in this part, and can carry out high production of the outstanding cell are realized.

[0102] Furthermore, in addition to the ability to lessen the curvature of a plate, the manufacture approach of the cell indicated to claim 7 of this invention can decrease internal short-circuit ultimately, and, moreover, has the features that the fall of a discharge property can be prevented. That is because this manufacture approach separates the welding edge welded to a collecting electrode plate at the predetermined spacing to the substrate outcrop of a substrate, welds the band-like metallic thin plate which prepares two or more cutting sections at the predetermined spacing, and becomes so that the active material restoration side edge of the opposite side of the welding edge may be made to connect, manufactures a plate to it and is judging the band-like metallic thin plate by predetermined width of face along with the welding edge to it. Thus, the plate with which the band-like metallic thin plate by which joining was carried out to the substrate outcrop was cut along with the welding edge can arrange the end face of an electrode group with an exact twist plane, where a laminating is carried out. Therefore, it can weld in a larger area and there are the features which can improve the high-rate-discharge property in a high current.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention welds [of a metal three-dimension porous body] a band-like metallic thin plate, and relates to the cell which connected the collecting electrode plate to the band-like metallic thin plate, and raised the high-rate-discharge property, and its manufacture approach.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] As an electrode plate used for an alkaline cell etc., there are a sintering type electrode and a non-sintering electrode. It has been used that a sintering type electrode is conventionally in use and mostly. This electrode infiltrates solutions, such as nickel salt and a force DOMIUMU salt, into a carbonyl nickel sintered compact, it carries out alkali treatment, active-material-izes, and is manufactured. However, since cost is reduced and it is made to a high energy consistency in recent years, the non-sintering electrode has become promising. A non-sintering electrode uses foaming nickel and metal three-dimension porous bodies, such as a nickel fiber porous body, as a substrate, fills up the opening of this substrate with a paste-like active material directly, and is manufactured.

[0003] Since a non-sintering electrode uses a metal three-dimension porous body for a substrate, like the punching metal used for the substrate of a sintering type electrode, it welds a lead plate to a substrate directly, and is not connectable with it. Since a metal three-dimension porous body has very few rates that almost all parts are openings and a metal part closes, even if it contacts a lead plate, it is because a touch area is restricted very small.

[0004] The technique which connects the substrate of a metal three-dimension porous body to a collecting electrode plate is indicated by the following official reports.

** JP,63-4562,A ** JP,2-220365,A [0005] ** The substrate outcrop which does not fill up the official report of ** with an active material along with the edge of the substrate of a metal three-dimension porous body is prepared, a band-like metallic thin plate is welded here, and the structure of connecting this part to a collecting electrode plate is indicated.

[0006] The electrode plate which welds [substrate] the band-like metallic thin plate is spirally wound through a separator, and serves as an electrode group. A collecting electrode plate 6 is welded and this spiral electrode group can be collected, as shown in the exploded view of drawing 1 . As shown in this drawing, the cell which welds [electrode / 4] a collecting electrode plate 6 raises a high-rate-discharge property, and can improve the discharge property in a high current.

[0007] However, when a band-like metallic thin plate is substrate welded [of a substrate], since heat telescopic motion with a metal three-dimension porous body and a band-like metallic thin plate is inharmonious, as shown in drawing 2 , the edge which welds the band-like metallic thin plate 10 contracts, the curvature of a plate arises, and there is a problem it becomes impossible to manufacture a uniform product. Ultrasonic welding of the band-like metallic thin plate 10 is carried out, or resistance electric welding of it is carried out, and it is welded to the substrate outcrop 7 of a substrate 9. The curvature of a plate becomes excessive although resistance electric welding is excellent in production efficiency. That is because contraction of the band-like metallic thin plate 10 becomes large by generation of heat at the time of resistance electric welding.

[0008] If the plate which curved as shown in drawing 2 carries out the laminating of the plate of another side through a separator, a location will shift. When the laminating of this is carried out and it is wound spirally, volume gap arises and it becomes impossible moreover, to arrange the end face of a swirl electrode group with a plane. The electrode group with the Maki gap lifting-comes to be easy of internal short-circuit, when pressing and welding a collecting electrode plate. It is because a projection part is crushed by the collecting electrode plate and breaks through a separator.

[0009] In order to cancel this fault, the cell which welds the band-like metallic thin plate which has the cutting section alternately to a substrate outcrop is developed (JP,64-71064,A). The cell indicated by this official report is alternately provided in the both sides of the band-like metallic thin plate 10 cutting section 14, as shown in drawing 3 . The plate which welded the band-like metallic thin plate 10 of this configuration to the substrate outcrop can lessen curvature.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] The cell of this invention has the features that internal short-circuit can be decreased ultimately, in the condition of having actually assembled as a cell while being able to lessen the curvature of the plate which welded [substrate] the band-like metallic thin plate. While it welds the band-like metallic thin plate with which the cell of this invention prepared two or more cutting sections at predetermined spacing in the substrate outcrop of the substrate of the 1st plate, it is because the band-like metallic thin plate is welded, this band-like metallic thin plate separates further the welding edge welded to a collecting electrode plate in the cutting section and the active material restoration side edge of the opposite side of the welding edge is made into the condition of continuing. The band-like metallic thin plate of this structure can lessen the curvature of the plate which welded [substrate] the band-like metallic thin plate by separating the welding edge by which joining is carried out to a collecting electrode plate in the cutting section. For this reason, the end face of the electrode group by which the laminating was carried out is arranged with a plane, and there are the features that a uniform product can be manufactured. Furthermore, since the band-like metallic thin plate of this structure makes the condition of continuing the active material restoration side edge of the opposite side of the welding edge, the features which decrease ultimately generating of internal short-circuit in this part, and can carry out high production of the outstanding cell are realized.
[0102] Furthermore, in addition to the ability to lessen the curvature of a plate, the manufacture approach of the cell indicated to claim 7 of this invention can decrease internal short-circuit ultimately, and, moreover, has the features that the fall of a discharge property can be prevented. That is because this manufacture approach separates the welding edge welded to a collecting electrode plate at the predetermined spacing to the substrate outcrop of a substrate, welds the band-like metallic thin plate which prepares two or more cutting sections at the predetermined spacing, and becomes so that the active material restoration side edge of the opposite side of the welding edge may be made to connect, manufactures a plate to it and is judging the band-like metallic thin plate by predetermined width of face along with the welding edge to it. Thus, the plate with which the band-like metallic thin plate by which joining was carried out to the substrate outcrop was cut along with the welding edge can arrange the end face of an electrode group with an exact twist plane, where a laminating is carried out. Therefore, it can weld in a larger area and there are the features which can improve the high-rate-discharge property in a high current.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, the cell which welded the band-like metallic thin plate of this structure to the substrate outcrop had the high probability which carries out internal short-circuit in the condition of having actually assembled, and had the fault to which the yield of a product worsens. Although this invention person etc. could lessen the curvature of the plate which welded the band-like metallic thin plate by the cutting section prepared alternately, he was not able to study why internal short-circuit would be carried out in the condition of having assembled. The swirl electrode group which carried out the laminating of the plate without curvature, and wound it is because an end face is arranged with a plane.
[0011] this invention person etc. studied having caused internal short-circuit by completely different cause, as a result of repeating further various trial-and-error, and completed this invention. therefore, the thing for which the important purpose of this invention welds [substrate] a band-like metallic thin plate, and can lessen the curvature of a plate -- in addition, it is in offering the cell which can decrease internal short-circuit ultimately, and its manufacture approach in the condition of having actually assembled as a cell.

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MEANS

[Means for Solving the Problem] Electrical connection of the cell of this invention is carried out to the electrode group 4 which carried out the laminating of the 1st plate 1 which consists of a positive-electrode plate and a negative-electrode plate, and the 2nd plate 2 through the separator 3, the sheathing can 5 which has contained this electrode group 4, and the 1st plate 1, and it is equipped with the collecting electrode plate 6 which connects the 1st plate 1 to one terminal electrically. The 1st plate 1 has the substrate outcrop 7 to which it is the non-sintering electrode which has filled up the substrate 9 of a metal three-dimension porous body with the active material, and the substrate 9 is exposed. The band-like metallic thin plate 10 is substrate welded [this / 7], and the band-like metallic thin plate 10 is welded [6]. Furthermore, the band-like metallic thin plate 10 by which joining is carried out to the substrate outcrop 7 has formed two or more cutting sections 14 at predetermined spacing. This cutting section 14 separated welding edge 10A welded to a collecting electrode plate 6, and has prepared active material restoration side edge 10B of the opposite side of welding edge 10A in the condition of continuing.

[0013] Furthermore, the cell indicated to claim 2 of this invention makes the cutting section 14 the shape of a straight line, circular, the ellipse form, the hen's egg form, or the triangle.

[0014] Furthermore, the cell indicated to claim 3 of this invention makes the depth of the cutting section 14 less than 100% at full [of the band-like metallic thin plate 10 / 30% or more of].

[0015] Furthermore, the cell indicated to claim 4 of this invention is setting to 50mm or less spacing of the cutting section 14 prepared adjacently.

[0016] Furthermore, the cell indicated to claim 5 of this invention makes the total die length of the aperture width of the cutting section 14 in welding edge 10A less than 10% of the overall length of the band-like metallic thin plate 10.

[0017] The manufacture approach of the cell indicated to claim 6 of this invention Welding edge 10A welded to a collecting electrode plate 6 at the substrate outcrop 7 of the substrate 9 which is the metal three-dimension porous body filled up with an active material is separated at the predetermined spacing. The joining process which welds the band-like metallic thin plate 10 which forms two or more cutting sections 14 at the predetermined spacing, and becomes so that active material restoration side edge 10B of the opposite side of welding edge 10A may be made to connect, and manufactures a plate, The laminating process which carries out the laminating of the 2nd plate 2 to the 1st plate 1 which welded the band-like metallic thin plate 10 through a separator 3, and manufactures the electrode group 4, It consists of the process which welds [which was formed in the 1st plate 1 of the electrode group 4 / band-like / 10] a collecting electrode plate 6, the process which inserts in the sheathing can 5 the electrode group 4 which comes to weld a collecting electrode plate 6, a process poured in the sheathing can 5, and a process which blockades opening of the sheathing can 5.

[0018] The manufacture approach of the cell indicated to claim 7 of this invention Welding edge 10A welded to a collecting electrode plate 6 at the substrate outcrop 7 of the substrate 9 which is the metal three-dimension porous body filled up with an active material is separated at the predetermined spacing. The joining process which welds the band-like metallic thin plate 10 which forms two or more cutting sections 14 at the predetermined spacing, and becomes so that active material restoration side edge 10B of the opposite side of welding edge 10A may be made to connect, and manufactures a plate, The decision process which judges a band-like metallic thin plate by predetermined width of face along with the welding edge, and the laminating process which carries out the laminating of the 2nd plate 2 to the 1st plate 1 which judged the band-like metallic thin plate 10 through a separator 3, and manufactures the electrode group 4, It consists of the process which welds [which was formed in the 1st plate 1 of the electrode group 4 / band-like / 10] a collecting electrode plate 6, the process which inserts in the sheathing can 5 the electrode group 4 which comes to weld a collecting electrode plate 6, a process poured in the sheathing can 5, and a process which blockades opening of the

sheathing can 5.
[0019] Furthermore, the manufacture approach of the cell indicated by claim 8 of this invention is judging the band-like metallic thin plate 10 in a decision process to the width of face which removes the cutting section 14.
[0020] The manufacture approach of the cell indicated to claim 9 of this invention While forming the substrate outcrop 7 of the substrate 9 of the metal three-dimension porous body filled up with an active material In the condition of separating welding edge 10A of the band-like metallic thin plate 10 from the joining process which welds the band-like metallic thin plate 10, and manufactures the 1st plate 1 to this substrate outcrop 7, and making active material restoration side edge 10B of the opposite side of welding edge 10A following it The cutting process which forms two or more cutting sections 14 at predetermined spacing, and the laminating process which carries out the laminating of the 2nd plate 2 to the 1st plate 1 which judged the band-like metallic thin plate 10 through a separator 3, and manufactures the electrode group 4, It consists of the process which welds [which was formed in the 1st plate 1 of the electrode group 4 / band-like / 10] a collecting electrode plate 6, the process which inserts in the sheathing can 5 the electrode group 4 which comes to weld a collecting electrode plate 6, a process poured in the sheathing can 5, and a process which blockades opening of the sheathing can 5.
[0021] The manufacture approach of the cell indicated to claim 10 of this invention makes the cutting section 14 of the band-like metallic thin plate 10 the shape of a straight line, circular, the ellipse form, the hen's egg form, or the triangle further again.
[0022]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained based on a drawing. However, the gestalt of operation shown below does not illustrate the cell and its manufacture approach for materializing the technical thought of this invention, and this invention does not specify a cell and its manufacture approach as the following.
[0023] Furthermore, this specification has appended the number corresponding to the member shown in the gestalt of operation to the member shown in "the column of a claim", and "the column of The means for solving a technical problem" so that it may be easy to understand a claim. However, there is never nothing what specifies the member shown in a claim as the member of the gestalt of operation.
[0024] The cell shown in drawing 4 is equipped with the electrode group 4 inserted in the sheathing can 5 and this sheathing can 5 of the shape of a cylinder airtightly sealed with the obturation plate 11, and the collecting electrode plate 6 which connects the electrode group 4 to the terminal 12 of the sheathing can 5. Although the cell shown in drawing makes the sheathing can 5 cylindrical, this invention does not specify the sheathing can of a cell in the shape of a cylinder. Although a sheathing can is not illustrated, it can also be made square tubed thru/or ellipse tubed, for example.
[0025] The sheathing can 5 is iron and is carrying out nickel plating of the front face. As for the quality of the material of the sheathing can 5, the optimal metal is chosen in consideration of the class and property of a cell. A sheathing can may be made into stainless steel, aluminum, and the product made from an aluminium alloy. The metal sheathing can 5 has sealed opening of upper limit airtightly by the lid. Lids are approaches, such as carrying out laser welding of the boundary of a lid to the structure of closing the sheathing can 5, or a sheathing can, and are fixed airtightly. The obturation plate 11 is fixing one terminal 12 of a cell. This terminal 12 is insulated and fixed to the sheathing can 5.
[0026] The cell of this invention is the cell having a non-sintering electrode, for example, a nickel hydoride battery. However, this invention does not specify a cell as a nickel hydoride battery. It can also consider as a nickel-cadmium battery, a lithium ion battery, etc. at a cell. Hereafter, the gestalt of operation of a nickel hydoride battery is explained in full detail as a gestalt of desirable operation.
[0027] The electrode group 4 has wound the 1st plate 1 and the 2nd plate 2 through a separator 3. The cell shown in drawing uses as a positive-electrode plate the 1st plate 1 connected to a collecting electrode plate 6, and is using the 2nd plate 2 as the negative-electrode plate. However, this invention can also use the 2nd plate as a positive-electrode plate by using the 1st plate as a negative-electrode plate. The 1st plate 1 and the 2nd plate 2 by which the laminating was carried out through the separator 3 are wound, and are manufactured by the spiral electrode group 4. The spiral electrode group 4 is inserted in the cylinder-like sheathing can 5. A spiral electrode group can be pressed from both sides, can be made to be able to deform into an ellipse form, and can be inserted in the sheathing can of an ellipse form. Furthermore, the electrode group inserted in an rectangular pipe-like sheathing can carries out the laminating of the 1st plate of two or more sheets and the 2nd plate which were cut out by tabular through a separator, and is manufactured.
[0028] As for a separator 3, the nonwoven fabric made from polyolefine is used. However, fine porosity film made of synthetic resin, such as polyethylene, can also be used for a separator 3. All the web materials that can insulate the 1st plate 1 and the 2nd plate 2 by which a laminating is carried out to both sides, and can permeate

the electrolytic solution can be used for a separator 3.
[0029] The 1st plate 1 is a non-sintering electrode which has filled up the substrate 9 of a metal three-dimension porous body with the active material. The substrates 9 of a metal three-dimension porous body are a foaming nickel porous body, a nickel fiber porous body, etc. The 1st plate 1 has filled up the substrates 9, such as this, with the active material.
[0030] The substrate of the 1st plate 1 forms the substrate outcrop 7 in the upper part of a substrate 9, as shown in the development view of drawing 5 , and other parts are made into the active material restoration section 8 filled up with the active material. The substrate outcrop 7 removes the active material filled up with or filled up with the active material, and is exposing the substrate 9. Preferably, a substrate 9 is pressed by the substrate outcrop 7, and is compressed into high density. The compressed substrate outcrop 7 has the features which can certainly weld a band-like metallic thin plate.
[0031] In order to connect electrically certainly with a collecting electrode plate 6, the substrate outcrop 7 fixes the band-like metallic thin plate 10, as shown in the sectional view of drawing 6 . Resistance electric welding of the band-like metallic thin plate 10 is carried out, or ultrasonic welding of it is carried out and it is pasted up in the condition of connecting with the substrate outcrop 7 electrically.
[0032] It is nickel sheet metal, phosphorus nickel sheet metal, and sheet metal that carried out nickel plating to iron, and the thickness is 0.05mm or more, and that of the band-like metallic thin plate 10 is thinner than 80% of thickness of the 1st plate 1. When a band-like metallic thin plate is made thinner than 0.05mm, the reinforcement when welding a substrate outcrop to a collecting electrode plate becomes less enough. If the thickness of a band-like metallic thin plate becomes thicker [the 1st plate] than 80% on the contrary, where the laminating of the 1st plate and the 2nd plate is carried out through a separator, a substrate outcrop will become thick and space efficiency will fall. Thickness of the band-like metallic thin plate 10 is preferably set to 0.08-0.2mm.
[0033] The band-like metallic thin plate 10 has formed the cutting section 14 at the predetermined spacing. The band-like metallic thin plate 10 of drawing 7 has formed the straight-line-like cutting section 14. The cutting section 14 separates welding edge 10A (it sets to drawing 7 and is an upper limb) welded to a collecting electrode plate, and is prepared in the band-like metallic thin plate 10 in the condition of making active material restoration side edge 10B (it setting to drawing 7 and being the margo inferior) of the opposite side of welding edge 10A continuing. As shown in drawing 8 , joining of the band-like metallic thin plate 10 of drawing 7 is carried out to the substrate outcrop 7 of a substrate 9.
[0034] Furthermore, the cell of this invention can also form the cutting section 14 of circular, an ellipse form, and a triangle in the band-like metallic thin plate 10, as shown in drawing 9 - drawing 11 . Moreover, as shown in drawing 12 , the cutting section 14 of various configurations can be made intermingled, and it can also prepare. Furthermore, although not illustrated, the cutting sections, such as a hen's egg form, can also be prepared.
[0035] The depth of the cutting section 14 is specified to less than 100% at full [of the band-like metallic thin plate 10 / 30% or more of]. When the cutting section was shallower than 30% and the band-like metallic thin plate 10 is substrate welded [of a substrate 9 / 7], it is because it becomes impossible to prevent the curvature of a plate effectively. Moreover, if the cutting section 14 is extended to active material restoration side edge 10B, where a cell is assembled, internal short-circuit will increase.
[0036] Furthermore, spacing of the cutting section 14 is specified as 50mm or less. When spacing of the cutting section 14 was too large and the band-like metallic thin plate 10 is substrate welded [7], it is because it becomes impossible to prevent the curvature of a plate effectively. Furthermore, although the band-like metallic thin plate 10 shown in drawing 7 , drawing 9 - drawing 12 has formed the cutting section 14 at equal intervals, a band-like metallic thin plate can also prepare the cutting section at the above-mentioned irregular spacing within the limits.
[0037] Furthermore, as shown in drawing 9 - drawing 12 , the band-like metallic thin plate 10 as for which opening is made to welding edge 10A by the cutting section 14 makes the total die length of the aperture width of the cutting section 14 in welding edge 10A less than 10% of the overall length of the band-like metallic thin plate 10. It is because the welding mark of a collecting electrode plate will decrease and the electric resistance between the band-like metallic thin plate 10 and a collecting electrode plate will become large, if aperture width becomes larger than this.
[0038] Preferably, the band-like metallic thin plate 10 forms the cutting section 14, and joining is carried out to the substrate outcrop 7 of a substrate 9. However, after substrate welding [of a substrate] a band-like metallic thin plate, it can also prepare the cutting section. The method of preparing the cutting section in the band-like metallic thin plate substrate welded cuts both a band-like metallic thin plate and a substrate outcrop, and prepares the cutting section.
[0039] Furthermore, the cell of this invention can also judge and remove a part with the cutting section 14, after

substrate welding [7] the band-like metallic thin plate 10 with the cutting section 14, as shown in drawing 13 . As shown in drawing, the band-like metallic thin plate 10 judged after joining welds the part which formed the cutting section 14 so that it may project from the substrate outcrop 7, it judges after that in the location shown with the chain line, and removes the part which formed the cutting section 14. Moreover, as shown in drawing 14 , the band-like metallic thin plate 10 which has the cutting section 14 in the substrate outcrop 7 which made width of face large can be welded, and it can also judge from the location shown with the chain line after that. There is no band-like metallic thin plate 10 of the 14 cutting section of such structures in the condition of welding a collecting electrode plate. For this reason, there are the features which can be welded in the condition ideal for a collecting electrode plate. However, the cell of this invention can leave some cutting sections, can judge a band-like metallic thin plate, and can also weld a collecting electrode plate.

[0040] The substrate 9 which welded the band-like metallic thin plate 10 adheres masking tape 13 to both sides, as shown in drawing 6 . Masking tape 13 has extended the lower limit edge to a lower part rather than active material restoration side edge 10B. The plate of this structure is for preventing active material restoration side edge 10B bending, and breaking through a separator 3, when pressing and welding a collecting electrode plate 6 to the substrate outcrop 7 and the band-like metallic thin plate 10. The cell on which masking tape 13 is pasted up prevents internal short-circuit, and can band-like weld [the substrate outcrop 7 and / 10] a collecting electrode plate 6. However, a substrate outcrop is also connectable with a collecting electrode plate in the condition of not using masking tape.

[0041] A collecting electrode plate 6 cuts a metal plate to disc-like [among the sheathing cans 5 / smaller than a form], and makes lead plate 6A project, as it is the metal plate which carried out nickel plating to iron, or metal plates, such as a nickel plate, and is shown in drawing 15 . A collecting electrode plate 6 is arranged so that it may counter at the both ends of the electrode group 4. Although the collecting electrode plate 6 shown in drawing 15 is not illustrated, for example since the cell of this invention is not specified as a cylindrical shape cell, although it is circular, in order that the sheathing can 5 of a cell may use it for the cell which is a cylindrical shape, it can use a rectangle-like collecting electrode plate for a square shape cell.

[0042] The collecting electrode plate 6 has prepared slit 6C in the both sides of feed-hole 6B, in order to lessen the reactive current when carrying out resistance electric welding. Furthermore, opening of two or more through tube 6D is carried out. As shown in the expanded sectional view of drawing 16 , projection 6E which projects caudad is provided in the periphery of through tube 6D. Projection 6E is welded and connected to the substrate outcrop 7 of the 1st plate 1 in two or more parts. Lead plate 6A of a collecting electrode plate 6 is connected to the terminal 12 fixed to opening of the sheathing can 5 by insulating.

[0043] When the substrate outcrop 7 and the band-like metallic thin plate 10 are welded [6], it is important to contact the substrate outcrop 7 and the band-like metallic thin plate 10 to a collecting electrode plate 6 at homogeneity. A collecting electrode plate 6 is in the condition locally pressed with a welding electrode rod, and whether it does not deform at all or deformation is too large, it becomes impossible to contact homogeneity in a weld. If deformation is too large, although the weld of near pressed with a welding electrode rod is pressed strongly, its contact of the weld in the part which is separated from a welding electrode rod will be weak, or will leave it. If a collecting electrode plate 6 does not deform at all, only the weld in which the collecting electrode plate 6 and the substrate outcrop 7 project contacts strongly, and other welds stop moreover, contacting. Welds are contacted [no] to homogeneity and it becomes impossible for this reason, to weld in the ideal condition.

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EXAMPLE

[Example] At the following processes, the cylindrical nickel hydoride battery of SC size was made as an experiment, the configuration of a band-like metallic thin plate was changed, and the curvature of a plate and internal short-circuit were measured.
[0045] At the following processes, the electrode group inserted in the sheathing can of a nickel hydoride battery was manufactured.
a. Manufacture of the positive-electrode plate which is the 1st plate (1) A metal porous body is produced at the following process. It is immersed in the plating liquid of a cell and the organic porous body of the shape of sponge which is polyurethane foam of an open cell is plated, after carrying out electric conduction processing. Predetermined time calcining of the plated organic porous body is carried out at the temperature of 750 degrees C, the resinous principle of an organic porous body is removed, further, it sinters by reducing atmosphere and a metal porous body is manufactured. The metal porous body manufactured at this process is foaming nickel which makes eyes about 600 g/m2, makes porosity 95%, and sets thickness to about 2.0mm.
[0046] (2) Knead the following and consider as the active material slurry of a positive electrode.
Nickel hydroxide powder 90 weight sections (they are contained using a 2.5wt% zinc and 1wt% cobalt as a coprecipitation component)
Cobalt powder Ten weight sections Zinc-oxide powder Three weight sections 0.2 % of the weight water solution of hydroxypropylcellulose .. 50 weight sections [0047] (3) The opening of a metal porous body was filled up with the active material slurry of the produced positive electrode. The fill was adjusted so that the active material consistency after roll rolling might serve as about 2.91g/cc-void. Then, it dried, and opening-RU rolling was performed so that thickness might be set to about 0.70mm. Furthermore, it cut in the shape of a strip of paper, and the ultrasonic exfoliation which adds vertical supersonic vibration removed the active material to the substrate outcrop 7 which welds the band-like metallic thin plate 10. And as shown in drawing 5 , it considers as the 1st plate 1 with the substrate outcrop 7 which a substrate 9 exposes.
[0048] The 1st plate can also manufacture a substrate outcrop at the following processes. As shown in drawing 17 , before being filled up with an active material, roll rolling of the part which is a part of metal porous body, and serves as the substrate outcrop 7 is carried out in parallel by predetermined width of face. Width of face of roll rolling is set to about 6 twice as manymm as the width of face of the substrate outcrop 7, and sets thickness after rolling to 0.5mm. Thus, the above-mentioned active material slurry is filled up with and rolled out to the substrate 9 of a metal porous body rolled out. Then, it cuts in the location shown by the arrow head of drawing 17 , and the strip-of-paper-like 1st plate 1 is produced. Then, along with the part used as the substrate outcrop 7 rolled out thinly, a compressed air is injected, or a brush etc. is used, an active material is removed, and a substrate 9 is exposed.
[0049] (4) Paste up the band-like metallic thin plate 10 on the substrate outcrop 7 which the substrate 9 exposed by resistance electric welding. The substrate outcrop 7 and the band-like metallic thin plate 10 set welding pressure to 10kgf(s), and carried out resistance electric seam welding. The nickel ribbon of 0.1mm thickness was used for the band-like metallic thin plate 10, and the width of face was set to 3mm.
[0050] b. Manufacture of the negative-electrode plate which is the 2nd plate (1) Weighing capacity of the manganese is carried out to 1.0:3.4:0.8:0.2:0.6 by the element ratio, and it mixes with production and the grinding misch metal (mixture of rare earth elements, such as La, Ce, Nd, and Pr) of a hydrogen storing metal alloy, nickel, cobalt, and aluminum, after putting this into a crucible and fusing with a RF fusion furnace, it cools, and the hydrogen storing metal alloy electrode of the following empirical formula is produced.
After carrying out coarse grinding of Mm1.0nickel3.4Co0.8aluminum0.2Mn0.6 and the obtained ingot of a hydrogen storing metal alloy beforehand, it is ground so that mean particle diameter may be set to 60

micrometers in inert gas.
[0051] (2) Add polyethylene oxide powder as a binder to the powder of the hydrogen storing metal alloy in which the hydrogen storing metal alloy slurry carried out production grinding, add and knead ion exchange water further to it, and consider as a slurry. The addition of the polyethylene oxide powder which is a binder is made into 1.0 % of the weight to a hydrogen storing metal alloy.
[0052] (3) Both sides of the substrate which is a punching metal were plastered with the slurry. The amount of application was adjusted so that the active material consistency after rolling might be set to cc in 5g /. Then, after performing desiccation and rolling, it cut in the predetermined dimension and considered as the negative-electrode plate which is the 2nd plate 2. The slurry left and applied the margo inferior so that a substrate outcrop might be made to the margo inferior of a punching metal. Moreover, after applying a slurry all over a punching metal, it can dry, the active material of the margo inferior can be removed, and a substrate outcrop can also be prepared.
[0053] The 1st plate 1 manufactured at the above process and the 2nd plate 2 were wound through SEBARETA 3 which consists of a nonwoven fabric made from polyolefine, it considered as the spiral electrode group 4, and the swirl electrode was produced. A collecting electrode plate 6 is band-like welded [which projects at the upper limit edge of this swirl electrode / 10] in resistance electric welding. The iron plate which carried out nickel plating with a thickness of 0.40mm by disc-like was used for the collecting electrode plate 6.
[0054] The 1st plate 1 and the 2nd plate 2 which were produced by the above approach were used, and the cylindrical nickel hydoride battery was made as an experiment. The cell made as an experiment changed as follows the configuration of the band-like metallic thin plate 10 used for the 1st plate 1, manufactured the cell, and inspected the number which carried out internal short-circuit with the amount of curvatures of a plate. The amount of curvatures of a plate was in the condition which welded [of the plate / substrate / 7] the band-like metallic thin plate 10, and as it was shown in drawing 2 , it was measured to it.
[0055] The cutting section of a [examples 1-8] band-like metallic thin plate was determined as shown in Table 1, and the 1st plate of 100 sheets was made as an experiment respectively. The 1st plate of 100 sheets was used and 100 electrode groups were made as an experiment. 100 electrode groups sorted out the thing without the Maki gap, inserted it in the sheathing can, and assembled the cell. Since only the electrode group without the Maki gap was inserted in the sheathing can and it assembled as a cell, in each example, it does not necessarily become 100 cells. For example, in 100 electrode groups, when the Maki gap was in 30 electrode groups, the number which assembled the 70 remaining electrode groups and short-circuited as a cell was inspected. The cell of the following examples and the example of a comparison sorted out only the electrode group without the Maki gap similarly, inserted it in the sheathing can, and was assembled as a cell.
[0056] That from which the depth and spacing of the cutting section differ the cutting section of a band-like metallic thin plate as the shape of a straight line as shown in drawing 7 was used for the cell of examples 1-8. The depth and spacing of the cutting section of a band-like metallic thin plate which are used for the cell of examples 1-8 were determined as shown in Table 1.
[0057]
[Table 1]

	切れ目		
	向き	切り込み長さ(mm)	切り込み間隔(mm)
実施例1	外側	1．0	30
実施例2	外側	2．0	30
実施例3	外側	2．5	30
実施例4	外側	2．0	10
実施例5	外側	2．0	20
実施例6	外側	2．0	30
実施例7	外側	2．0	40
実施例8	外側	2．0	50
比較例1	無し		
比較例2	内側	2．0	30
比較例3	千鳥状	2．0	30

[0058] Furthermore, in order that the cell of the example of this invention might compare how the outstanding property is shown, the cutting section of a band-like metallic thin plate was used as the cell of the examples 1, 2, and 3 of a comparison like the above-mentioned example except changing as follows.
The 1st plate was created using the band-like metallic thin plate without the [example 1 of comparison] cutting section, this 1st plate was used, and the cell was made as an experiment like the example 1.
The 1st plate was created using the band-like metallic thin plate which prepared the cutting section which sets the [example 2 of comparison] depth to 2mm at intervals of 30mm, and the cell was made as an experiment using this 1st plate. Without separating the welding edge, the cutting section prepared it, as the active material restoration side edge of the opposite side was separated.
The band-like metallic thin plate which prepared alternately the cutting section which sets the [example 3 of comparison] depth to 2mm at intervals of 30mm was produced, and the cell was manufactured using this 1st plate.
[0059] The short generating number of the amount of curvatures of the 1st plate made as an experiment as mentioned above and the cell which used this 1st plate became as it is shown in Table 2.
[0060]
[Table 2]

	反り量(mm)	巻ズレ	内部ショート
実施例1	0．02	0	0
実施例2	0．01	0	0
実施例3	0．01	0	0
実施例4	0．00	0	0
実施例5	0．01	0	1
実施例6	0．00	0	0
実施例7	0．01	0	1
実施例8	0．02	0	0
比較例1	1．57	100	電池にならない
比較例2	0．07	1	33
比較例3	0．01	0	28

[0061] Like [it is ****** from this table and], the cell of this invention had few amounts of curvatures of a plate, and the Maki gap and its internal short-circuit also decreased. Although the amount of curvatures of a plate decreased, the cell of the example 3 of a comparison which used the band-like metallic thin plate which prepared the cutting section alternately is in the condition assembled as a cell, and no less than 28% of cell carried out internal short-circuit. Moreover, although the amount of curvatures of a plate decreased, no less than 33 cells carried out the internal short-circuit of the cell of the example 2 of a comparison which used the band-like metallic thin plate which prepared the cutting section so that an active material restoration side edge might be separated.

[0062] If shallow, the amount of curvatures of a plate will become large, the Maki gap also becomes large, and it becomes easy to carry out the internal short-circuit of the cutting section prepared in a band-like metallic thin plate. In order to examine the Maki gap and the internal short-circuit to the depth of the cutting section, the band-like metallic thin plate which prepared the cutting section which makes the depth 30% or less was used, and the cell was made as an experiment like the above-mentioned example. Consequently, when the width of face of the cutting section became 30% or less, the Maki gap became large and the rate which carries out internal short-circuit increased. As for the cell of this to this invention, it is desirable to make full [of a band-like metallic thin plate / 30% or more of] the depth of the cutting section prepared in a band-like metallic thin plate. Furthermore, if the depth of the cutting section is made 100%, since the cutting section will be extended to an active material restoration side edge, the depth of the cutting section is made shallower than 100%.

[0063] Moreover, even if spacing of the cutting section prepared in a band-like metallic thin plate is large, the amount of curvatures becomes large, the Maki gap of a plate becomes large, and it becomes easy to carry out internal short-circuit. In order to examine the amount of curvatures and the Maki gap to spacing, and internal short-circuit of the cutting section adjoined and prepared, the band-like metallic thin plate which prepared the cutting section which sets spacing to 50mm or more was used, and the cell was made as an experiment like the above-mentioned example. Consequently, when spacing of the cutting section exceeded 50mm, the amount of curvatures and the Maki gap became large, and the rate which carries out internal short-circuit increased. As for the cell of this to this invention, it is desirable to set to 50mm or less spacing of the cutting section prepared in a band-like metallic thin plate.

[0064] Furthermore, the configuration of the cutting section was changed and the cell of the following examples was made as an experiment. The cell of the following examples was made as an experiment like the cell of the above-mentioned example except changing the configuration of the cutting section.

[0065] That from which the depth of the cutting section differs the cutting section of a band-like metallic thin plate as an equilateral triangle as shown in drawing 11 was used for the cell of the [examples 9 and 10] examples 9 and 10. The depth of the cutting section of the band-like metallic thin plate used for the cell of examples 9 and 10 was determined as shown in Table 3. The triangle which is the cutting section set die length of one side to

1mm. Moreover, spacing of the cutting section was set to 30mm.
[0066] The depth of the cutting section of a band-like metallic thin plate was determined as shown in Table 3, and the 1st plate of 100 sheets was made as an experiment respectively. The 1st plate of 100 sheets was used and 100 electrode groups were made as an experiment. 100 electrode groups sorted out the thing without the Maki gap, inserted it in the sheathing can, and assembled the cell.
[0067]
[Table 3]

	打ち抜き位置長さ(深さ)(mm)	全幅に対する深さ割合(%)	開放部延べ長さ(mm)	全長に対する割合(%)
実施例9	1.0	33.3	10.4	3.7
実施例10	1.5	50.0	15.6	5.6

[0068] The amount of curvatures of the plate of the cell made as an experiment as mentioned above, and the Maki gap and a short incidence rate became as it is shown in Table 4.
[0069]
[Table 4]

	極板反り(mm)	不良発生数／100セル中		高率放電 30A放電時作動電圧(V)
		巻ズレ(セル)	ショート(セル)	
実施例9	0.02	1	0	1.039
実施例10	0.01	0	0	1.037

[0070] Like [it is ****** from this table and], the cell of this invention had few amounts of curvatures of a plate, and the Maki gap and its internal short-circuit also decreased.
[0071] Furthermore, the configuration of the cutting section was circularly changed from the triangle, and the cell of the following examples was made as an experiment. The cell of the following examples was made as an experiment like the cell of the above-mentioned example except changing the configuration of the cutting section.
[0072] That from which the depth of the cutting section differs the cutting section of a band-like metallic thin plate as circular as shown in drawing 9 was used for the cell of the [examples 11 and 12] examples 11 and 12. The depth of the cutting section of the band-like metallic thin plate used for the cell of examples 11 and 12 was determined as shown in Table 5. The radius of a circle was set to 1mm. Moreover, spacing of the cutting section was set to 30mm.
[0073] The depth of the cutting section of a band-like metallic thin plate was determined as shown in Table 5, and the 1st plate of 100 sheets was made as an experiment respectively. The 1st plate of 100 sheets was used and 100 electrode groups were made as an experiment. 100 electrode groups sorted out the thing without the Maki gap, inserted it in the sheathing can, and assembled the cell.
[0074]
[Table 5]

	打ち抜き位置長さ(深さ)(mm)	全幅に対する深さ割合(%)	開放部延べ長さ(mm)	全長に対する割合(%)
実施例11	1.0	33.3	18.0	6.4
実施例12	1.8	60.0	10.8	3.9

[0075] The amount of curvatures of the plate of the cell made as an experiment as mentioned above, and the Maki gap and a short incidence rate became as it is shown in Table 6.
[0076]
[Table 6]

	極板反り (mm)	不良発生数／１００セル中		高率放電３０A放電時作動電圧(V)
		巻ズレ(セル)	ショート(セル)	
実施例１１	0．０１	0	0	1．０３７
実施例１２	0．０２	1	0	1．０３８

[0077] Like [it is ****** from this table and], the cell of this invention had few amounts of curvatures of a plate, and the Maki gap and its internal short-circuit also decreased.
[0078] Furthermore, the configuration of the cutting section was changed into the triangle from which the depth differs, having used aperture width as the same, and the cell of the following examples was made as an experiment. The cell of the following examples was made as an experiment like the cell of the above-mentioned example except changing the configuration of the cutting section.
[0079] Although the cell of the [examples 13 and 14] examples 13 and 14 made the triangle the cutting section of a band-like metallic thin plate as shown in drawing 11 , this triangle set the aperture width of the welding edge constant by 2mm, and changed the depth of triangular top-most vertices. The depth of the cutting section of the band-like metallic thin plate used for the cell of examples 13 and 14 was determined as shown in Table 7. Spacing of the cutting section which is a triangle was set to 30mm.
[0080] The depth of the cutting section of a band-like metallic thin plate was determined as shown in Table 7, and the 1st plate of 100 sheets was made as an experiment respectively. The 1st plate of 100 sheets was used and 100 electrode groups were made as an experiment. 100 electrode groups sorted out the thing without the Maki gap, inserted it in the sheathing can, and assembled the cell.
[0081]
[Table 7]

	打ち抜き位置長さ(深さ) (mm)	全幅に対する深さ割合(%)	開放部延べ長さ (mm)	全長に対する割合(%)
実施例１３	1．５	５０．０	１８．０	６．４
実施例１４	２．５	８３．３	１８．０	６．４

[0082] The amount of curvatures of the plate of the cell made as an experiment as mentioned above, and the Maki gap and a short incidence rate became as it is shown in Table 8.
[0083]
[Table 8]

	極板反り (mm)	不良発生数／１００セル中		高率放電３０A放電時作動電圧(V)
		巻ズレ(セル)	ショート(セル)	
実施例１１	0．０１	0	0	1．０３８
実施例１２	0．０１	0	0	1．０３８

[0084] Like [it is ****** from this table and], the cell of this invention had few amounts of curvatures of a plate, and the Maki gap and its internal short-circuit also decreased.
[0085] Furthermore, the configuration of the cutting section was made circular, spacing of the cutting section was changed, and the cell of the following examples was made as an experiment. The cell of the following examples was made as an experiment like the cell of the above-mentioned example except changing the cutting section.
[0086] That from which the depth of the cutting section is set constant by 1mm as circular as shown in drawing 9 , and spacing of the cutting section differs the cutting section of a band-like metallic thin plate was used for the cell of the [examples 15-20] examples 15-20. Spacing of the cutting section of the band-like metallic thin plate used for the cell of examples 15-20 was determined as shown in Table 9. However, the radius of a circle was set to 1mm.
[0087] Spacing of the cutting section of a band-like metallic thin plate was determined as shown in Table 9, and

the 1st plate of 100 sheets was made as an experiment respectively. The 1st plate of 100 sheets was used and 100 electrode groups were made as an experiment. 100 electrode groups sorted out the thing without the Maki gap, inserted it in the sheathing can, and assembled the cell.

[0088]

[Table 9]

	打ち抜き間隔 (mm)	開放部延べ長さ (mm)	全長に対する割合(%)
実施例15	10	56.0	20.0
実施例16	15	36.0	12.9
実施例17	20	28.0	10.0
実施例18	30	18.0	6.4
実施例19	40	14.0	5.4
実施例20	50	10.0	3.6

[0089] The amount of curvatures of the plate of the cell made as an experiment as mentioned above, and the Maki gap and a short incidence rate became as it is shown in Table 10.

[0090]

[Table 10]

	極板反り (mm)	不良発生数／100セル中		高率放電 30A放電時 作動電圧(V)
		巻ズレ(セル)	ショート(セル)	
実施例15	0.02	1	0	1.016
実施例16	0.01	0	0	1.021
実施例17	0.03	0	1	1.027
実施例18	0.01	0	0	1.037
実施例19	0.01	0	1	1.035
実施例20	0.02	2	0	1.038

[0091] Like [it is ****** from this table and], the cell of this invention had few amounts of curvatures of a plate, and the Maki gap and its internal short-circuit also decreased. This table also shows that the discharge voltage at the time of making it discharge by 30A falls, if the total die length of the aperture width of the cutting section exceeds 10% to the overall length of a band-like metallic thin plate. For this reason, in order to receive the high rate discharge in a high current, as for the total die length of opening of the cutting section, it is desirable to carry out to less than 10% of the overall length of a band-like metallic thin plate.

[0092] Furthermore, while making the configuration of the cutting section circular, the radius of the circle which is the cutting section was changed and the cell of the following examples was made as an experiment. The cell of the following examples was made as an experiment like the cell of the above-mentioned example except changing the radius of the circle which is the cutting section.

[0093] That from which the depth of the cutting section is set constant by 1mm as circular as shown in drawing 9 , and the radius of a circle differs the cutting section of a band-like metallic thin plate was used for the cell of the [examples 21-28] examples 21-28. The radius of the circle which is the cutting section of the band-like metallic thin plate used for the cell of examples 21-28 was determined as shown in Table 11. However, the depth of the cutting section presupposed that it is fixed by 1mm. Moreover, spacing of the cutting section was set to 30mm.

[0094] Spacing of the cutting section of a band-like metallic thin plate was determined as shown in Table 11, and

the 1st plate of 100 sheets was made as an experiment respectively. The 1st plate of 100 sheets was used and 100 electrode groups were made as an experiment. 100 electrode groups sorted out the thing without the Maki gap, inserted it in the sheathing can, and assembled the cell.

[0095]

[Table 11]

	半 径 (mm)	切り欠き、または打ち抜き	
		開放部延べ長さ (mm)	全長に対する割合(%)
実施例21	0．75	12．7	4．5
実施例22	1．00	18．0	6．4
実施例23	1．25	22．0	7．9
実施例24	1．50	25．5	9．1
実施例25	1．75	28．5	10．2
実施例26	2．00	31．2	11．1
実施例27	2．25	33．7	12．0
実施例28	2．50	36．0	12．9

[0096] The amount of curvatures of the plate of the cell made as an experiment as mentioned above, and the Maki gap and a short incidence rate became as it is shown in Table 12.

[0097]

[Table 12]

	極板反り (mm)	不良発生数／100セル中		高率放電 30A放電時 作動電圧(V)
		巻ズレ(セル)	ショート(セル)	
実施例21	0．01	0	1	1．038
実施例22	0．01	0	0	1．037
実施例23	0．01	1	0	1．038
実施例24	0．01	0	1	1．037
実施例25	0．01	1	0	1．028
実施例26	0．01	0	0	1．025
実施例27	0．01	0	0	1．022
実施例28	0．02	0	1	1．021

[0098] Like [it is ****** from this table and], the cell of this invention had few amounts of curvatures of a plate, and the Maki gap and its internal short-circuit also decreased. This table also shows that the discharge voltage at the time of making it discharge by 30A falls, if the total die length of the aperture width of the cutting section exceeds 10% to the overall length of a band-like metallic thin plate. For this reason, in order to receive the high rate discharge in a high current, as for the total die length of opening of the cutting section, it is desirable to carry out to less than 10% of the overall length of a band-like metallic thin plate.

[0099] The above example welded [of the plate / substrate] the band-like metallic thin plate which prepared the

cutting section, and manufactured the plate with little curvature. However, the cell of this invention can also manufacture a plate with little curvature, so that the welding edge of a band-like metallic thin plate is judged and ** is not inferior to the above-mentioned example, after substrate welding [of a plate] the band-like metallic thin plate which prepared the cutting section. Since aperture width of the cutting section is made as for this plate to 0 by cutting off the part which prepared the cutting section of a band-like metallic thin plate, it is improved by the high-rate-discharge property in a high current. Incidentally as for the cell made as an experiment by this approach, the electrical potential difference when discharging by 30A became as high as 1.039V, and the amount of curvatures of a plate was set to only 0.01mm.

[0100] Furthermore, a plate with little curvature can also be manufactured, so that the welding edge of a band-like metallic thin plate may be separated and ** is not inferior to the plate which welded and manufactured the band-like metallic thin plate which has the cutting section by preparing the cutting section to the substrate outcrop, after substrate welding [of a plate] the band-like metallic thin plate in which the cell of this invention does not have the cutting section again.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The decomposition perspective view showing the condition of connecting a collecting electrode plate to the plate of the electrode group built in a cell
[Drawing 2] The top view showing the plate which welded the band-like metallic thin plate and curvature produced
[Drawing 3] The top view of the band-like metallic thin plate which has the cutting section of the conventional cell
[Drawing 4] The cell of the example of this invention is a cross-section front view a part.
[Drawing 5] The development view of the plate of the cell shown in drawing 4
[Drawing 6] The expanded sectional view showing the laminated structure of the electrode group of the cell shown in drawing 4
[Drawing 7] The top view showing the condition of having prepared the cutting section in the band-like metallic thin plate
[Drawing 8] The top view showing the condition of having substrate welded [of the substrate] the band-like metallic thin plate shown in drawing 7
[Drawing 9] The top view showing other examples of a band-like metallic thin plate which prepared the cutting section
[Drawing 10] The top view showing other examples of a band-like metallic thin plate which prepared the cutting section
[Drawing 11] The top view showing other examples of a band-like metallic thin plate which prepared the cutting section
[Drawing 12] The top view showing other examples of a band-like metallic thin plate which prepared the cutting section
[Drawing 13] The perspective view showing an example of the manufacture approach of a plate
[Drawing 14] The perspective view showing other examples of the manufacture approach of a plate
[Drawing 15] The development view of the collecting electrode plate of the cell shown in drawing 4
[Drawing 16] The expanded sectional view of the collecting electrode plate shown in drawing 15
[Drawing 17] The top view showing an example of a process which prepares a substrate outcrop in a plate
[Description of Notations]
1 -- The 1st plate
2 -- The 2nd plate
3 -- Separator
4 -- Electrode group
5 -- Sheathing can
6 -- Collecting electrode plate 6A -- Lead plate 6B -- Feed hole
6C -- Slit 6D -- Through tube
6E -- Projection
7 -- Substrate outcrop
8 -- Active material restoration section
9 -- Substrate
10 -- Band-like metallic thin plate 10A -- Welding edge 10B -- Active material restoration side edge
11 -- Obturation plate
12 -- Terminal
13 -- Masking tape

14 -- Cutting section

[Translation done.]

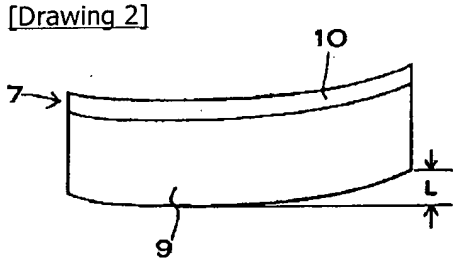
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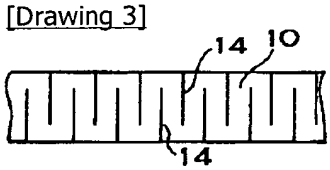
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DRAWINGS

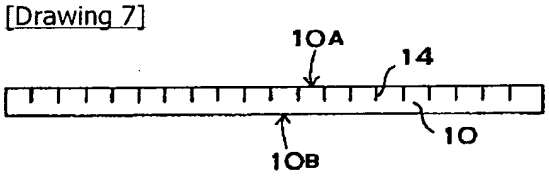
[Drawing 2]



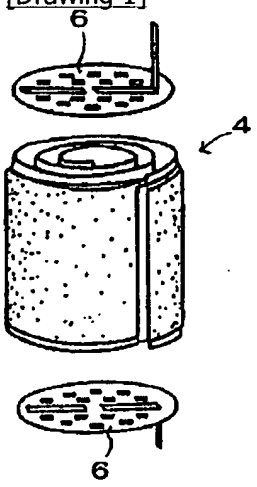
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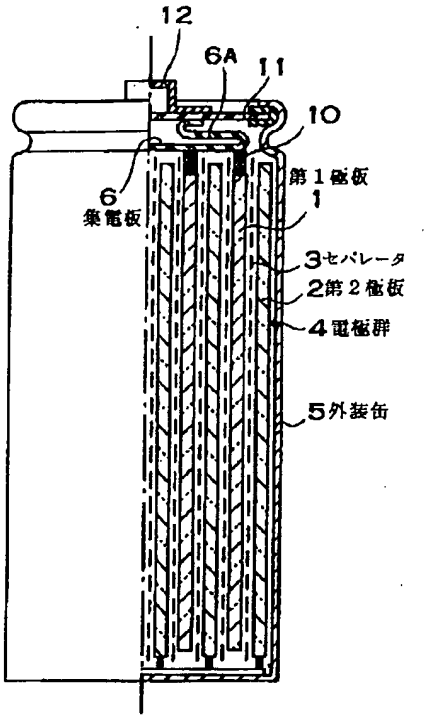
[Drawing 7]



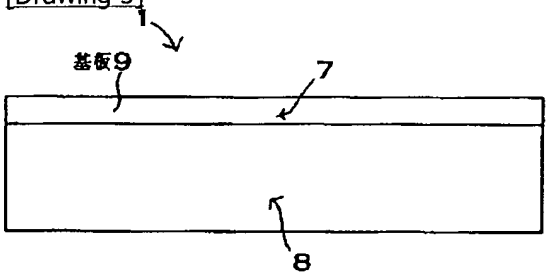
[Drawing 1]



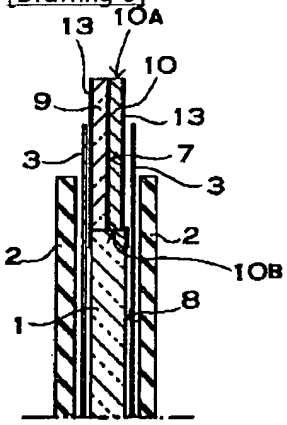
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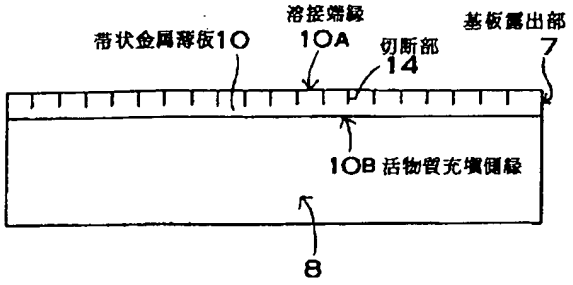
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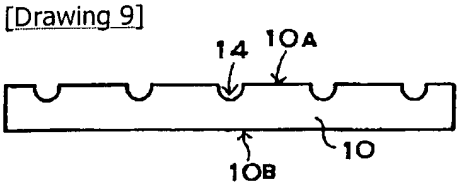
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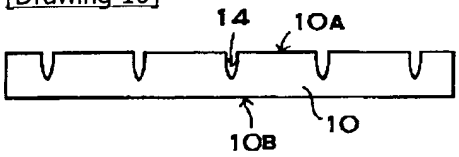
[Drawing 8]



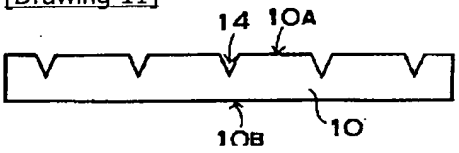
[Drawing 9]



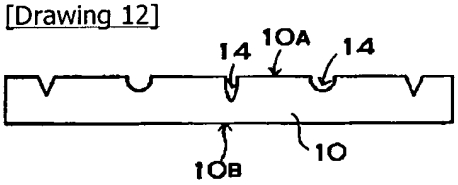
[Drawing 10]



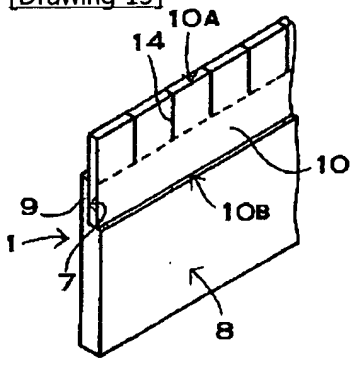
[Drawing 11]



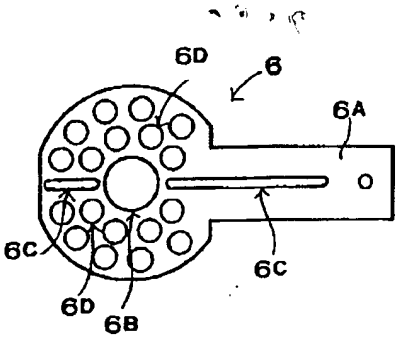
[Drawing 12]



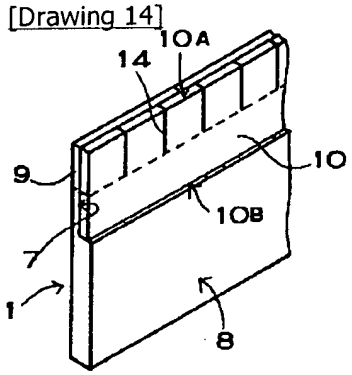
[Drawing 13]



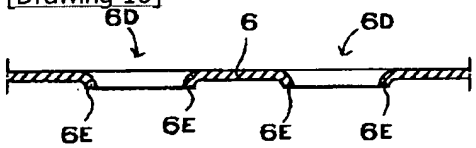
[Drawing 15]



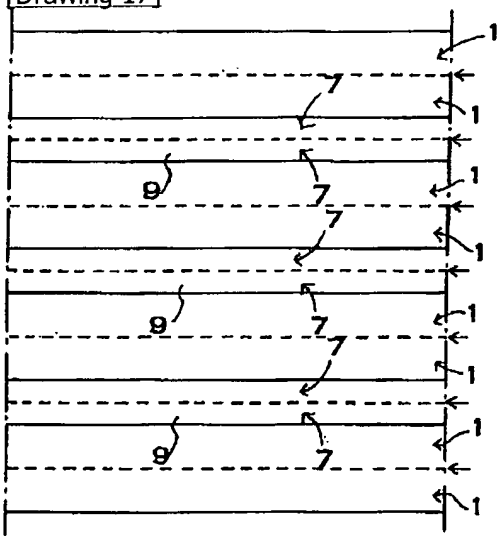
[Drawing 14]



[Drawing 16]



[Drawing 17]



[Translation done.]